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Contributions to the Journal can be made as either a research article or a review article.

1. A research article presents new knowledge and issues discovered from research originally conducted by the authors.

2. A review article elaborates on particular matters grounded from scholarly analysis and synthesis, with accurate references, of a wide range of sources, including theories, concepts and research publications.

It will be assumed that submitted manuscripts have not been published elsewhere, and they are not currently being considered by another journal.

KJSS reserves the right not to publish the article by the same author (s) more than once within one year, so as to give other authors a chance to get published, and in order to maintain diversity of authors, topics, theories and methodology.

Responsibility for contents

Responsibility for contents are the authors. Reviewed manuscripts do not represent the opinion nor the responsibility of the editorial board and Kasetsart University.

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The Journal Editorial Board will consider submitted manuscripts prepared in accordance with the following instructions.

1. Manuscript. A double-spaced manuscript is required on A4 paper using 12-point Times New Roman. Each article must not exceed 18 typed pages.

2. Title. The title must be concise and precise to the content.

3. Author. The full name of each author is required.

4. Contact Details. The contact details for the corresponding author must be convenient for contact by Journal staff.

5. Abstract. An abstract must not exceed 250 words and must contain all key points in the article. No more than five keywords must be provided.

6. Content. Writing style of a **research article** should conform to the research methodology and tradition accepted for a given research philosophy/paradigm. The content comprises the following headings.

Introduction: Explain the research rationale justified by appropriate citations, objectives, research questions or hypotheses. A concise literature review may be included as appropriate.

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To allow for writing flexibility, the content of the introduction and the literature review sections may be integrated to form a strong grounded introduction.

Research methodology: Identify data collection methods, duration and data analysis. The methods may be quantitative, qualitative, or mixed, as appropriate to the research purpose.

Research findings: Present the findings together with relevant supportive evidence revealed from the research, either in the forms of figures, tables or diagrams.

Conclusion and recommendations: Conclude the research with discussion/reflections and recommendations based on the research findings.

7. Figures and Tables. Figures and tables must be annotated as necessary and must be sequentially numbered. Figures must be clear and relevant to major points in the text. Photographs should be in black and white, with color used if necessary. The captions of figures and tables must be concise and precise.

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b. Book without DOI (Print version)

Babbie, E. (2007). *The practice of social research* (11th ed.). Thomson Higher Education.

c. Edited Book Chapters

McAlister, A. L., Perry, C. L., & Parcel, G. S. (2008). How individuals, environments, and health behaviors interact: Social cognitive theory. In K. Glanz, B. K. Rimer, & F. M. Lewis (Eds.), *Health behavior and health education: Theory, research, and practice* (3rd ed., pp. 67–98). John Wiley & Sons, Inc.

Wilson, R. A., & Briscoe, G. (2003). The impact of human capital on economic growth: A review. In P. Descy & M. Tessaring (Eds.), *Impact of education and training. Third report on vocational training research in Europe: Background report*. Office for Official Publications of the European Communities. Retrieved from https://www2.warwick.ac.uk/fac/soc/ier /publications/2003/wilson_and_briscoe_2003.pdf

d. Dictionary or encyclopedia

Landau, S., & Chis Ster, I. (2010). Cluster analysis: Overview. In P. Peterson, E. Baker, & B. McGaw (Eds.), *International Encyclopedia of Education* (3rd ed., pp. 72–83). Elsevier. https://doi.org/10.1016/B978-0-08-044894-7.01315-4

Periodical:

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Charrad, M., Ghazzali, N., Boiteau, V. Niknafs, A., & Niknafs, A. (2014). NbClust: An R package for determining the relevant number of clusters in a data set. *Journal of Statistical Software*, *61*(6), 1–36. https://doi.org/10.18637/jss.v061.i06

b. Journal article without DOI, with URL

Sillick, T J., & Schutted, N. S. (2006). Emotional intelligence and self-esteem mediate between perceived early parental love and adult happiness. *E-Journal of Applied Phychology*, *2*(2), 38–48. http://ojs.lib.swin.edu.au/index.php/ejap

c. Journal article without DOI from academic research database or print version

Richard, L., Rollerson, B., & Phillips, J. (1991). Perceptions of submissiveness: Implications for victimization. *Journal of Psychology*, *125*(4), 407–411.

d. Newspaper article/Magazine article/Blog post

Guarino, B. (2017, December 4). How will humanity react to alien life? Psychologists have some predictions. The Washington Post. https://www.washingtonpost.com/news/speaking-of-science/wp/2017/12/04/how-will-humanity-react-to-alien-life-psychologists-have-some-predictions/

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a. Unpublished doctoral dissertation or master's thesis

Namsa-ghuan, K. (2011). *Practice pattern: Reflection of moral practice students* [Unpublished doctoral dissertation]. Kasetsart University.

b. Doctoral dissertations or Master's thesis from a database

McNiel, D. S. (2006). *Meaning through narrative: A personal narrative discussing growing up with an alcoholic mother* [Master's thesis, California State University-Long Beach]. ProQuest Dissertations and Theses database (UMI No. 1434728).

c. Doctoral dissertations or Master's thesis published online (not in a database)

Bruckman, A. (1997). *MOOSE Crossing: Construction, community, and learning in a networked virtual world for kids* [Doctoral dissertation, Massachusetts Institute of Technology]. http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-3029

Conference sessions or Presentations:

Türkcan, B., Caliskan, T. E., & Kaya, A. A. (2009, June 17–19). *Industrial clusters as a regional development tool: A spatial analysis on Turkey* [Paper presentation]. EconAnadolu 2009: Anadolu International Conference in Economics, Eskisehir, Turkey. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.521.9793&rep=rep1&typ e=pdf

Jahnkassim, P. S., & Ip, K. (2006, September 6–8). *Linking bioclimatic theory and environmental performance in its climatic and cultural context – an analysis into the tropical high rises of Ken Yeang* [Paper Presentation]. The 23rd International Conference on Passive and Low Energy Architecture, Geneva, Switzerland.

Research Reports:

U.S. Bureau of the Census. (1991). *Child support and alimony: 1989* (Current Population Reports, Series P-60, No. 173). U.S. Government Printing Office.

Lichtentein, J. (2013). *Profile of veteran business owners: More young veterans appear to be starting businesses* (Issue Brief No. 1). U.S. Small Business Administration, Office of Advocacy. https://www.sba.gov/sites/default/files/Issue%20Brief%201,%20Veteran%20Business%20Owners.pdf

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Halaburda, H., & Piskorski, M. J. (2010). Platforms and limits to network effects. Retrieved from http://hbswk.hbs.edu/item/6428.html

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Regional local wisdom as an antidote to radicalism in Indonesia

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Abstract

Local wisdom is central to counteracting radicalism that is rampant in Indonesia. The purpose of this research is (1) to examine the haul tradition of KH. Ali Mas'ud is a religious figure who is believed by the community as Waliyullah; (2) Integrating the symbolic value of the haul tradition of KH. Ali Mas'ud as an antidote to radicalism in Indonesia; (3) Analyzing the value of tolerance contained in the haul tradition of KH. Ali Mas'ud. The research method used in this research is a symbolic interpretative approach. Data were obtained qualitatively from observations and interviews with religious leaders, community leaders, pilgrims, and the people of Sidoarjo Regency. The results showed that the haul tradition of KH Ali Mas'ud, which was filled with prophetic sholawat activities, hadrah art, grand tahlil, and grand recitation, was able to involve the participation of people from various villages in the sub-district and even the district to support the implementation of the haul event, which was attended by thousands of visitors and pilgrims from various regions for approximately seven days. The values that grow in the haul event include tolerance and solidarity in the wider community. Thus, it can prevent the rise of radicalism in Sidoarjo Regency.

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Introduction

The life of Indonesia's diverse society has a diversity that has an impact on differences in ethnicity, religion, race, and group. The issue in Indonesia today concerns radicalism developed through educational institutions, schools, and pesantren (Malik et al., 2017). The emergence of radicalism in Indonesia is caused by various factors, including religion, politics, economy, social, educational environment, and culture participating in it (Nasution, 2019). Groups that are suspected of radicalism that still exist in Indonesia have even been disbanded but are still carrying out actions, including Jemaah Islamiyah, the Islamic Defenders Front (IDF), Hizbut Tahrir Indonesia (HTI), and groups of community organizations affiliated with the Islamic State in Iraq and Syria (ISIS)

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that carry out movements openly and covertly (Adnan & Amaliyah, 2021; Harahap et al., 2023). The adoption of Saudi religious movements such as wahabism, salafism, as well as the influence of alternative westernization are the causes of Indonesian people's increasingly radical thingking (Syam et al., 2020). It is proposed that three key components are needed for the radicalization process to occur: the activation of the significance quest (for example, through humiliation or a loss of significance), a belief system that sees terrorism as the means to this end (i.e., an ideology that justifies terrorism), and social processes (i.e., networks where group dynamics occur) that serve as conduits for terrorism (Pfundmair et al., 2022). The radicalism group opposes the government, insults the State, damages State symbols, insults the head of State, and even insults other religious groups.

The impact of radicalism is harmful, including terrorism, division, fighting, the spread of *hoax news,* social conflicts, human rights violations, and even threatening the existence of the Unitary State of the Republic of Indonesia. The effort to prevent radicalism is to develop an attitude of tolerance, mutual respect for diversity, unity, and cooperation. Efforts to prevent radicalism cannot be focused on the government alone but require cooperation from various parties, namely, families, schools, religious institutions, and society in general. Boy Rafli Amar (BNPT), in the BNPT 2022 year-end press conference, stated that the active participation of all levels of society in Indonesia has a positive influence on the process of countering terrorism in Indonesia. Understanding the younger generation about the dangers of radicalism is essential because the impact of radicalism is divisive and devastating. The target dimension index in 2022 was 51, 54 lower than the RPJMN target of 54.26. The terrorism risk index in 2022, consists of the target dimension and the supply dimension of the perpetrator. Based on the assessment result, this exceeds the target set in the National Medium-Term Development Plan (RPJMN) 2020–2024 (InfoPublik, 2022).

Indonesia, which has various islands, tribes, and customs, stores a wealth of traditions, culture, and local wisdom in each region. Introducing noble values embodied in local wisdom will instill respect for diversity, tolerance, peace, and harmony. National culture is a series of local cultures owned by regional regions in Indonesia. If local culture is widely recognized and appreciated, it can form an identity and identity of the Indonesian nation. This fosters a sense of pride in Indonesian culture to encourage the community to maintain and preserve the ancestral heritage culture, ultimately creating harmony and unity. Indonesia is the country with the largest Muslim-majority population in the world. Islam has a living and growing tradition in its community of followers. The tradition of haul became part of the culture and life of Muslims in Asia. The tradition of haul in Indonesia is carried out differently in each region. However, the urgency is the same to pay respect, appreciate, commemorate services, and exemplify the stories of scholars and religious figures in the local area.

Sidoarjo is a regency located in the East Java region. One of the radical events near the Sidoarjo Regency area was the bomb explosion at the Bethel Injil SeFull church in Gempol area on November 13, 2011, involving Sidoarjo residents. From 2012 until now, Sidoarjo has become a refuge for Shia from Sampang who are in conflict with Sunnis and seek security by living in the Sidoarjo Regency area. In 2013 a conflict occurred between the Ansor Youth Movement and the Qur'anic Tafsir Council (QTC) about different interpretations of religious teachings that led to demonstrations. As a regency area with regional culture and local wisdom that grows and is sustainable, the people of Sidoarjo Regency should try to ward off radicalism through local wisdom that their people have preserved. Each community group has grown a lot of unique local cultural diversity along with its symbols and meanings that contain many noble lessons (Niswatin et al., 2022) as a form of adaptation to the natural and social environment. A tradition is a form of habit that is preserved continuously with various symbols and rules that apply to a community group to ensure that the noble values contained in the tradition can continue to live and be preserved (Sisweda et al., 2020).

Radicalism is often developed through religious issues, interpretations of religious teachings, and differences in understanding from religious organizations. So, it is considered necessary to counteract radicalism through activities of a religious nature, activities which are alive and preserved by the local community. In this study, the author seeks to reveal the superiority of local wisdom as an alternative to prevent radicalism from an early age, especially among the younger generation. This research is used to strengthen emotional bonds, community identity, a forum for dialogue on religious issues, differences, and economic inequality. Therefore, it is recommended for the younger generation to be more intense in using social media.

This study examines efforts to prevent radicalism by using the local wisdom of K.H. Ali Mas'ud's haul tradition, which is considered waliyulloh by the people of Sidoarjo Regency and its surroundings.

This study gives a new nuance from previous research. Research (Amin et al., 2022) examines the same topic about preventing radicalism. The difference is that this study uses the tradition of Syafaral Anam, which examines the value of music and religious songs. Research by Suciati & Erzad (2018) examines the tradition of celebrating Eid al-Fitr and Eid al-Adha, which can dampen the radicalism movement in Kudus society. On the other hand, Rahmawati et al. (2019) research reveals the dance traditions carried out by the Gorontalo community, while the research conducted by Khuriyah et al. (2022) uses the concept of natural schools to ward off radicalism.

Literature Review

Local knowledge lives in every region of Indonesia. In the current era of globalization, it is essential to maintain and preserve local wisdom that has grown in the community because it can be used as an identity where the community lives. The noble values contained in local wisdom can filter the entry of negative influences of foreign cultures, including preventing the concept of radicalism because the value of local wisdom has been rooted in people's lives (Suciati & Erzad, 2018). Preventing radicalism through local wisdom is an exciting idea Hodriani et al. (2021) because turning into a radical does not just happen but through processes and stages. It can also be influenced by social, psychological, and environmental life, so the approach to local wisdom is considered very important and influential. The local policy in the haul tradition is to instill respect for diversity, tolerance and harmony. In addition, a person should not be forced to abandon his beliefs in favor of another religion or mazhab (Rahman, 2021).

On the tradition of haul KH. Ali Mas'ud has the value of life that society upholds so that individuals can maintain an inclusive view and are open to differences that impact being able to control radical influence (Suharto, 2017). The community feels it has a forum for dialogue on religious issues, differences, and economic disparities, thus strengthening emotional bonds and identity as a community with traditions. From the findings of this study, it can be recommended to strengthen the community, especially the younger generation, who are more intense with social media than the tomb of KH. Ali Mas'ud, and the tradition of haul KH. Ali Mas'ud, confirmed by the Sidoarjo Regency Government as a religious tourism destination, was able to erode and prevent radicalism.

The symbolic interactive theory of John Dewey, Charles Horton Cooley, George Herbert Mead and Herbert Blumer states that natural interactions between individuals develop through symbols created by habit. The symbols in question include sounds, physical movements, and body expressions. The sound symbols are referred to in the haul of K.H Ali Mas'ud when performing grand dhikr, sholawat, tahlil, and hadrah art. Sound symbols are usually in the form of nasyid that can be understood by certain people (Derung, 2017).

Methodology

The research was conducted on the people of Sidoarjo Regency. This research uses qualitative methods with interactive data collection techniques, namely data collection in the form of observation, interviews, and documentation. Data collection is carried out in natural settings. Data analysis techniques use analysis based on the Miles and Huberman model by reducing data, presenting data, and then drawing conclusions. Researchers simultaneously reduce, sort, and conclude while the data are available, then simultaneously repeat with the next informant.

The results of observations were carried out at the haul implementation site which was attended by various groups of people from various organizations and different communities including Nahdlatul Ulama residents, scholars / kyai, students from various pesantren, hadrah organizations throughout East Java, tahfidz, and the surrounding community. Interviews were conducted with the head of Pagerwojo village where the haul was held, Mr. Mulyanto, SH, community leaders, the organizing committee, and the people who participated in the haul. Furthermore, documentation from several websites and online news obtained data that the haul of KH. "Ali Mas'ud is one of the religious traditions that has been going on since 1979 AD and is used as a tourist asset for the Sidoarjo district government because it is proven to have an impact on social life, economy, culture, and moral strengthening, as well as the conduciveness of community life.

Results and Discussion

Character KH. Ali Mas'ud

The existence of the tomb of KH. Ali Mas'ud in Pagerwojo Village, Buduran District, Sidoarjo Regency,

is a pilgrimage tourism destination for the community that cannot be separated from the charisma of KH. Ali Mas'ud, who was a religious figure who helped with many problems in the surrounding community, both in the economic sector, family problems, business, and so on, through his prayers during his life (Fauzi, 2019).. The community believed Ali Mas'ud to be a pious person, and during his life, many events that occurred outside human reason showed his specialty the lucky stories of KH. Ali Mas'ud circulated orally in the community for generations. One of the characteristics that shows KH. Ali Mas'ud's specialty is that KH. Ali Mas'ud's guardianship is able to Kashfy everyone who talks about him in his heart. One day, KH. Ali Mas'ud said to someone, "Jarene wali, how come you do that?" out loud, making the person shocked and apologize. Although KH. Ali Mas'ud was ummi or illiterate, Allah SWT bestowed on him the ability to read the Yellow Book and the Qur'an fluently and explain its meaning (Azwara et al., 2023).

The tomb is a cultural space that unites various cultures of the people in it. There are various interests of people who carry out ritual traditions that become routine, and there are various patterns of action as an act of preserving ancestral traditions (Kumalasari, 2022). As a form of respect for the ancestors, the community-made pilgrimages and prayed (Mustawhisin et al., 2019). Tomb of KH. Ali Mas'ud was visited by the people of Sidoarjo and its surroundings, even from outside Java. The attraction of the tomb of KH. Ali Mas'ud is a pilgrimage based on the testimony of pilgrims. They believe that by routinely making pilgrimages and praying there, the problems experienced can be solved, and they feel calm (Aminudin, 2015).

Haul KH. Ali Mas'ud

The haul is a tradition of Selametan Muslims, which is actualized by praying together, making pilgrimages to the tomb of scholars, cleaning tombs, sharing food, and being equipped with Islamic art. This activity is a forum to strengthen friendship between Muslims, togetherness, mutual assistance, precedence, and unity. Implementation of the tradition of Haul KH. Ali Mas'ud awakened the social role of the community in Sidoarjo Regency. This haul tradition is filled with events that are KH's favorite. Ali Mas'ud, during his life, was the prophet's prayer, hadrah, Qur'anic semaan, and recitation. During his life, he liked to follow hadrah (reading sholawat accompanied by a tambourine). He also memorized the Qur'an, so the habit of KH. Ali Mas'ud, during his life, was preserved by the community to be used as a tradition and ancestral cultural heritage.

Antidote to Radicalism

Seeing the enthusiasm of people from various regions who number in the thousands to participate in the peak event of the KH haul tradition, Ali Mas'ud, many positive things that can be analyzed to be used as moral reinforcement for the younger generation, especially to counteract radicalism, are described in Table 1.

Impact of Haul Kh. Ali Mas'ud Tradition

Tomb of KH. Ali Mas'ud in Pagerwojo Village, Buduran District, Sidoarjo Regency, is visited by pilgrims daily. There are various motivations for pilgrims to pray at the tomb of KH. Ali Mas'ud because they believe in the power possessed by KH. Ali Mas'ud's as prayers were always answered, and the people believe that KH. Ali Mas'ud was Waliyullah. The tradition of haul, which is annually commemorated in the month of Rajab in the Islamic calendar, impacts various sectors of people's lives both from the Sidoarjo area itself and from outside the region. Researchers from the local wisdom of the KH haul tradition can analyze the impact. Ali Mas'ud is shown in Table 2.

Table 1 Haul KH's activity. Ali Ma'ud in preventing radicalism

No	Activity	Value	Efforts to prevent radicalism
1	Sholawat of the Prophet	Spiritual	The moral message and spirit of struggle in upholding Islam as done by the Prophet Muhammad PBUH
2	Hadrah	Beauty	Forming people with noble morals according to the example given by the Prophet Muhammad SAW, so that they can become good citizens (good citizenship)
3	Grand recitation	Ideological	Majlis Taklim, in the form of a grand recitation with charismatic Kyai speakers, is very appropriate to instill and strengthen religious ideology and Pancasila ideology. As an information agent to fortify society from the influence of radicalism
4	Tahlil akbar	Humanitarian relations	Social and cultural media bind relationships between people means of socialization and communication, so young people are not divided when foreign influences enter.

Source: Secondary data processed on 2022 as a source

Table 2 Impact of haul tradition KH. Ali Mas'ud

No	Field	Impact
1	Politics	Traditions containing religious activities create a society with good citizenship.
2	Religion	Religious teachings and community traditions about selamectin blend without conflict.
3	Economics	A large number of pilgrims makes the economic sector of the local community eager to open businesses that can improve family welfare.
4	Social interaction	Social solidarity when the haul event is carried out depends on the people of Pagerwojo Village and those in other villages. For example, in hadrah and seaman Quran events, the surrounding village community feeds pilgrims packaged in rice boxes or packaged rice.
5	Local government policy	The Regional Government of Sidoarjo Regency determined the grave area of KH. Ali Mas'ud is a religious tourism area of Sidoarjo Regency.
6	Local government policy	Karomah and privileges of KH. Ali Mas'ud was spoken orally by the community for generations, thus creating enthusiasm for the younger generation to pilgrimage to the tomb of KH. Ali Mas'ud as a routine, especially on Friday nights.

Source: Secondary data processed on 2022 as a source

Discussion

The local wisdom of the Sidoarjo community in the form of the KH haul tradition. Ali Mas'ud, with a series of events held for seven days, can mean that the community has a high tolerance attitude and good social interaction. This is an essential social capital to be developed to counteract the influence of radicalism. The existence of the tomb of KH. Ali Mas'ud is a forum for friendship and a place of community communication. Haul KH. Ali Mas'ud suggests community unity in material and emotional forms to preserve traditions passed down from generation to generation (Nurdin et al., 2019). People living in countries with differences in religion, ethnicity, culture, and race are not allowed to commit acts of radicalism in the form of violence, intimidation, and blasphemy. Tolerance and social solidarity will strengthen people in various aspects of life, thus creating harmony and tranquility in daily life.

Radicalism in the younger generation can be prevented early through local wisdom through the KH haul tradition. Ali Mas'ud. This is because believing in worship rituals will create nationalism and patriotism in the region and country (Mariyono, 2020). As it is today, world countries also strengthen their countries from the influence of terrorism through local wisdom (Batlajery, 2018). It instills the value of tolerance and social solidarity through the local wisdom of the KH haul tradition. Ali Mas'ud is one of the efforts to win over intolerance in society, especially among the younger generation. The spread of hoax news through intense social media can endanger the beliefs of the younger generation about the ideology of the State of Indonesia. It can influence the thinking of the younger generation that justifies acts of radicalism, optimizing the value of tolerance and social solidarity in the KH haul tradition. Ali Mas'ud continued to be strengthened.

One of the acts of radicalism often found in Indonesia today is that groups or individuals provoke by demonizing the activities of other groups different from themselves. They adopt extreme religious interpretations and are harsh, ignoring the value of tolerance and diversity (Hafid, 2020). It is essential to introduce local wisdom to the younger generation so that they realize their identity and create nationalism in themselves.

Based on the similarity analysis with previous research, this study seeks to find the strength of community social solidarity not only formed at the village scale but also at the sub-district scale by contributing food to guests, pilgrims, and hadrah participants in East Java. However, several studies have something to do, namely, the research by (Pajarianto et al., 2022) about local wisdom of kinship, which only reveals tolerance for religious differences, and research by (Rasyid et al., 2023) using local wisdom to resolve conflicts with a religious approach. The findings of this study are that the wisdom of local haul KH. Ali Mas'ud not only strengthens the value of tolerance but, most importantly, is social solidarity that grows in the broader community not only on a village scale but even to other villages in Buduran District, who contribute to the success of the event to make blessings that means that themselves and their families are always given blessings by the Creator. As long as culture does not conflict with religious teachings in society, then the culture can still grow side by side, in the sense that local culture and religion complement each other to realize the attitude of cultured religious wisdom (Khoiruddin, 2023).

Conclusion and Recommendation

Local knowledge is recognized as significantly influencing and impacting people's behavior patterns. Haul KH. Ali Mas'ud, who is believed by the community to be Waliyullah in which there are religious activities in the form of recitation of the prophet's prayers, the art of hadrah, tahlil akbar, seaman alquran, grand recitation, can prevent radicalism in society. Qualitative data show that the tradition of haul KH. Ali Mas'ud raises the value of tolerance and high social solidarity in society. The wider community can feel its impact on various sectors of life.

Conflict of interest

The authors declare that there is no conflict of interest.

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From conflict to reconciliation: The role of memorialization in shaping collective memory at conflict heritage sites

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Abstract

This study explores memorialization's role in shaping collective memory and supporting the reconciliation process at conflict sites. The focus is on the Tugu Perlawanan Rakyat conflict monument in Sedie Jadi Village, Bener Meriah Regency, Aceh, Indonesia. The research methods used include direct observation, in-depth interviews, and analysis of historical documents. study found that the Tugu Perlawanan Rakyat conflict monument in Sedie Jadi is a visual reminder of past events and a centre for ongoing social activities and peace education. The conflict monument in Sedie Jadi plays a significant role in preserving collective memory and supporting reconciliation by involving all community layers, including the younger generation. These findings differ from previous research that viewed monuments as static structures, emphasizing instead that these monuments serve as educational tools and instruments to avoid cycles of revenge. The implications of this study are crucial for developing future policies and practices in memorialization. Governments and other stakeholders should encourage community participation in the memorialization process and ensure that monuments serve as static symbols and dynamic media for education and reconciliation. Additionally, further research is needed to examine the long-term impacts of memorialization on collective memory and reconciliation, as well as to develop more effective strategies in various local contexts.

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Introduction

The historical journey of Indonesia is often marked by prolonged conflicts that have had significant social impacts. One of the most prominent conflicts is the armed conflict in Aceh, which lasted for over three decades. The Aceh conflict with the Indonesian government occurred from 1976 to 2005 (Rafiie et al., 2017). This conflict left deep scars on all parties involved, including the local community. The Aceh conflict not only caused physical destruction but also resulted in profound psychological trauma for the local population (Grayman et al., 2009; Rahman et al., 2022; Rahman et al., 2023). After the conflict ended, efforts emerged to rebuild Acehnese society and address past wounds through various activities and programs, one of which is memorialization at conflict heritage sites. Memorialization was conducted by erecting conflict memorials to commemorate past conflicts' tragedies.

Numerous conflict memorials were built in Aceh post-conflict. At least 15 memorials were constructed based on events from different periods of the conflict. These memorials are spread across various regions of Aceh, including East Aceh, Bener Meriah, Lhokseumawe, Pidie, Pidie Jaya, Aceh Besar, Aceh Jaya, Nagan Raya, and South Aceh. These memorials signify efforts to preserve collective memory and honor the victims of the conflict.

The memorialization of the Aceh conflict in Bener Meriah began with a historical event that occurred in Kresek Village, now known as Sedie Jadi Village. The event had a profound impact on the communal memory of the local community. On June 5, 2001, a tragedy occurred in Kresek Village, where five residents were killed, and houses were burned. The event left deep wounds in the community. The tragedy was not only an important point in the formation of the collective memory of the villagers. The monument was erected in the village to commemorate the tragedy and as a symbol of sacrifice and the courage of the residents in facing threats.

Memorialization through the construction of conflict memorials plays a crucial role in shaping the community's collective memory. One example is the conflict memorial in Bener Meriah Regency. The memorials and conflict sites in Bener Meriah have become essential symbols representing shared experiences, suffering, and hopes for reconciliation (Zaninovi, 2023). Through the memorialization process, communities involved in and affected by the conflict remember the past and build a shared narrative that can support the healing process and reconciliation. Thus, memorialization can be an effective tool for creating mutual understanding, building collective identity (Bar-tal, 2009; Sumartojo, 2016; Zaninovi, 2023), and strengthening social bonds that were disrupted by the conflict (Sabila et al., 2024).

The collective memory formed through memorialization can be a powerful tool for overcoming social divisions and strengthening community identity (Rahman, 2020; Takševa, 2018). On the other hand, memorialization can also present challenges, such as differences in historical interpretation and the potential to reignite old tensions. Therefore, understanding how memorialization practices influence collective memory and social dynamics at heritage sites becomes important in the post-conflict context (Marschall, 2013).

Memorializing heritage post-conflict aims to ensure that these events are not forgotten and serve as an educational tool and reminder for future generations. In recent decades, many countries have utilized cultural heritage sites to promote reconciliation, peace, and social recovery.

For example, in Germany, the Holocaust Memorial in Berlin serves as a powerful reminder of the atrocities of World War II and the Holocaust, as well as a symbol of Germany's commitment to preventing such events from happening again (Dolgoy & Elżanowski, 2018). In Rwanda, the Kigali Genocide Memorial Centre was built to commemorate the victims of the 1994 genocide and promote reconciliation among divided communities (Sinalo & Irakoze, 2022). Similarly, in Cambodia, there is the Tuol Sleng Genocide Museum. Originally a high school, it was converted into a high-security prison by the Khmer Rouge regime and became a site of torture and execution for thousands of prisoners. After the fall of the Khmer Rouge, the site was transformed into a museum to remember the victims of the Cambodian genocide and to educate future generations about the horrors that occurred (Brown & Millington, 2015; Williams, 2022).

However, previous studies on memorial monuments tend to focus on the general aspects of memorialization without considering specific local dynamics. Examples from Germany, Rwanda, and Cambodia demonstrate the importance of understanding local contexts to delve deeper into the meanings of such memorialization. This study emphasizes the importance of understanding the local context in Desa Sedie Jadi, providing deeper insights into how the local community interacts with their monuments and heritage sites.

This research explores memorialization's role in shaping collective memory at conflict heritage sites in Bener Meriah Regency, Aceh. It employs a qualitative

approach to examine how the local community understands, interprets, and interacts with conflict memorial sites. The study will also examine how the memorialization process can support or hinder reconciliation and community building post-conflict. In Aceh, memorialization has begun at several conflict heritage sites. Monuments, commemorative ceremonies, and history museums have been established as efforts to remember the past and educate the younger generation about the importance of peace.

This study starts from the argument that memorialization also presents challenges. There is debate over how historical events should be remembered and presented, who has the right to determine these narratives, and how to ensure that memorialization efforts do not perpetuate resentment or exclude certain perspectives. Additionally, the constantly changing political and social dynamics can affect how a community views its past and chooses to remember it.

Therefore, the effectiveness of memorialization in shaping collective memory and promoting grassroots reconciliation still requires further research. How can memorialization facilitate the reconciliation process? Are local communities actively involved in this process? Moreover, what are the long-term impacts of memorialization on the social life and collective identity of the Aceh community?

Literature Review

The Concept of Memorialization at Conflict Heritage Sites

Monuments are tributes to famous figures (Savage, 2009) or significant events (Bellentani & Panico, 2016), and the construction of memorial monuments influences various dimensions of urban space. Collective or social memory is co-constructed by monuments (Cudny & Appelblad, 2019; O'Connor, 2022; Sadowski, 2021) thus, public spaces are affected by the presence of monuments. Furthermore, monuments are closely related to social memory (Antonova et al., 2017). Social memory is a key element in creating such relationships, and monuments are an important component. Monuments create images of specific urban spaces and represent the famous figures and history associated with those areas. Because monuments create the image of the area, they also influence the sense of place (Cudny & Appelblad, 2019).

Memorialization is a social and cultural process in which communities and societies build monuments, memorials, or other sites to commemorate significant historical events, especially those related to conflict or tragedy. Memorialization at conflict heritage sites serves to remember the past, honor the victims, and educate future generations. It can strengthen collective identity and provide space for social reflection (Beckstead et al., 2011).

The Theory of Collective Memory

Collective memory is a concept that refers to the way a group of people remembers, interprets, and celebrates their past together. According to Maurice Halbwachs, who first introduced this concept, collective memory results from social and cultural interactions that enable a group to form identity and solidarity through shared memories (Kwon, 2022). Collective memory encompasses significant events, traditions, and symbols that hold special meaning for a community.

Collective memory and memorialization are interrelated. Memorialization is the process by which communities build monuments, memorials, or other sites to commemorate significant historical events, especially those related to conflict or tragedy. Memorialization can strengthen collective identity and provide space for social reflection (Harju, 2015). Monuments and memorial sites serve as physical tools for remembering the past, honouring victims, and educating future generations about significant historical events.

Monuments and memorial sites have an important role in shaping the social identity of a community. They commemorate past events and articulate the values and beliefs the community wants to preserve. The collective memory shaped by monuments can influence how a community views itself and its relationships with others (Moliner & Bovina, 2023). In this context, monuments become symbols of collective identity that help strengthen solidarity and a sense of togetherness.

The process of memorialization also has important implications for post-conflict reconciliation. Memorialization can provide a space for reflection and dialogue, which is crucial for the collective healing process. Memorial sites are focal points for collective memory that allow communities to reflect on and understand their past (Dittmer & Waterton, 2016). In reconciliation, memorialization can help address past trauma by providing a shared narrative acknowledged by all parties involved. In the context of memorialization at conflict heritage sites, collective memory helps preserve the memory of traumatic events and guides the healing and reconciliation process.

Grassroots Reconciliation Strategies

Grassroots reconciliation refers to efforts undertaken by local communities to resolve conflicts and build peace independently, without significant external intervention (Kamatsiko, 2015). Effective reconciliation should involve the direct participation of the communities affected by the conflict (Lahai & Ware, 2013). This approach includes inter-community dialogue, cultural ceremonies, and community development projects that strengthen social relationships. In Bener Meriah, culturally based conflict reconciliation demonstrates the community's efforts to build peace and reconciliation at the local level, recognizing the importance of community participation in a sustainable reconciliation process.

This study will focus on the application of the above concepts in Bener Meriah. In Bener Meriah, the People's Resistance Monument becomes the focus in studying how memorialization can strengthen collective memory and support the reconciliation process at the local level. This research is expected to provide a deeper understanding of the role of memorialization in shaping collective memory and supporting grassroots reconciliation strategies. The existence of the Conflict Monument in Sedie Jadi Village also plays a significant role in fostering the collective identity of the local community. The monument not only serves as a physical symbol of the traumatic events that once occurred, but it also functions as a bond that ties together shared emotions and memories, strengthening the sense of solidarity among the residents. The process of memorialization embodied by this monument allows the community to reflect on their shared history and experiences while also building a collective narrative that forms the foundation of the community's identity in Sedie Jadi.

Methodology

This study was conducted in Sedie Jadi Village, Bener Meriah Regency, Aceh Province, Indonesia. Sedie Jadi has a significant history of conflict, mainly related to the attack in Kampung Kresek (now known as Sedie Jadi Village). The research employs a qualitative approach to examine memorialization practices at conflict memorial sites in Sedie Jadi Village. The focus is on understanding how the memorialization process affects the local community's collective memory and social identity.

Participants

This study's participants include members of the Sedie Jadi community, local leaders, and individuals involved in creating and maintaining the conflict memorial sites. Participants were selected based on their involvement in the memorialization process and their knowledge of local history.

Data Collection

Data were collected through in-depth interviews, observations, and document analysis. The researchers conducted in-depth interviews with the residents of Sedie Jadi, local leaders, and those involved in creating and maintaining the conflict memorial sites. The interviews were semi-structured, allowing the researcher to explore topics that emerged during the interviews. The questions were designed to understand the participants' experiences, perceptions, and interpretations regarding the memorialization sites.

Observations were conducted to understand the social and cultural context of the conflict memorial sites and how the community interacts with these sites. During the observations, the researcher made field notes that included descriptions of the physical environment, social interactions, and activities related to the memorialization sites. The documents analyzed include local archives, related publications, and official documents regarding the conflict and the memorialization process in Sedie Jadi Village.

Data Analysis

Data collected through in-depth interviews, observations, and document analysis were analyzed using a thematic analysis approach.

Results

Kampung Kresek in the Context of the Aceh Conflict

The conflict in Aceh lasted for over three decades, starting in the mid-1970s until the signing of the Helsinki Memorandum of Understanding (MoU) in 2005. The Free Aceh Movement (GAM) was one of the main actors in this conflict, fighting for Aceh's independence from Indonesia. This conflict resulted in many casualties, mass displacement, and the destruction of infrastructure and the economy in Aceh. The Indonesian government

and GAM were involved in a series of armed clashes that had a wide-ranging impact on the civilian population.

In the early 2000s, the Free Aceh Movement (GAM) announced its willingness to negotiate a ceasefire if military operations, including checkpoints, house-to-house searches, and other actions to find GAM members, were halted. In May 2000, GAM and the Indonesian authorities agreed on a humanitarian pause (Czaika & Kis-Katos, 2009; Schulze, 2003; Schulze, 2004). However, this peace did not last long. In April 2001, a massive military offensive was launched by Indonesia to end the GAM separatist rebellion. The people's hopes were dashed when this ceasefire quickly collapsed due to violations by both sides—GAM and the Indonesian National Army (TNI)—inadequate monitoring mechanisms, and the absence of sanctions. In response to the subsequent increase in violence, Presidential Instruction (Inpres) No. 4 was issued, which included the Security Restoration Operation (Opslihkam). The Indonesian government also continued the implementation of the special autonomy package, which came into effect in January 2002. Since GAM did not budge from its position for independence, Jakarta issued an ultimatum in August 2002 for the movement to accept autonomy, followed by a siege of one of the rebel strongholds in November 2002. Shortly after, on December 9, 2002, GAM and the Indonesian government finalized a Cessation of Hostilities Agreement, which Jakarta initially hailed as a peace agreement but was viewed by GAM as merely another ceasefire. Unsurprisingly, violations by both sides quickly began to undermine this agreement as well, leading to Aceh once again plunging into war in May 2003 (Schulze, 2003).

Central Aceh Regency, including Kampung Kresek, was one of the areas most severely affected during this period. GAM, the military, or local militias killed hundreds of people. Around 32,000 people fled Central Aceh and sought refuge in surrounding areas (Czaika & Kis-Katos, 2009). There are several reasons why some people did not leave their homes to seek refuge. First, the violence was not randomly targeted, so certain individuals or groups within the population were more vulnerable to being targeted by armed groups, making them more likely to flee than others. Second, when deciding whether to stay or leave, individuals or families considered security and other traditional (socio-economic) factors (Czaika & Kis-Katos, 2009). In this context, Kampung Kresek (now known as Sedie Jadi Village) experienced one of the tragic events in the history of the Aceh conflict.

The Tragedy of the Attack on Kampung Kresek

Kampung Kresek, now known as Sedie Jadi Village, is a village located in Bukit District, Bener Meriah Regency. It is the last village in the district and is surrounded by coffee plantations. The topography of the Kampung Kresek area is typical of hilly regions, with winding roads surrounding the hills. Sedie Jadi Village covers an area of 350 hectares and is divided into three hamlets: Kresek Hamlet, Sidorejo Hamlet, and Sejahtera Hamlet. The majority of the residents of Sedie Jadi Village are farmers. The village borders Timang Gajah Village to the north, Pondok Gajah Village to the south, Batin Baru Village to the east, and Uwak Pondok Sayur Village to the west.

On Tuesday night, June 5, 2001, Kampung Kresek experienced a brutal attack. Armed groups stormed the village, driving out the residents and burning their homes. This attack resulted in the deaths of five people, including a two-year-old child (Abonita, 2022). Additionally, the attack included the burning of residents' houses, with a total of 15 homes and the village hall destroyed (Wijaya, 2021). The battle in the village lasted for more than six hours, and at midnight, dozens of attacking troops left the village (Warsidi, 2019).

Some of the victims who died in the attack were Pirin (60 years old), whose body was partially burned, and Edy Suyono, who was shot and died while being evacuated to a bunker. Zen Kaharuddin (50 years old) died in the bunker from a heart attack, and Marnak (60 years old) died, with his body only discovered after residents extinguished the fire in one of the houses. Finally, Yuni Prastiana (2 years old) died on the way to the hospital after being shot.

This tragedy prompted the residents of Kampung Kresek to form an anti-GAM front. Following the incident, residents remained vigilant and sought to strengthen themselves, even by creating homemade weapons. From Kampung Kresek, various anti-GAM organizations later emerged throughout Bener Meriah and Central Aceh. These resistance movements were established independently by groups of people to protect themselves from GAM. Examples include Gabungan Putra Daerah (GARUDA), Puja Kesuma Tanah Gayo, and several other organizations. These movements continued to strengthen themselves by making weapons, which ultimately added to the chaos in the region.

Conflict Monument in Sedie Jadi Village

The Conflict Monument in Sedie Jadi Village stands as a symbol of the struggle and memory of the local community, built purely by the initiative of the village residents. Currently, the monument is located opposite the village maternity clinic (Polindes) in Sedie Jadi Village. It stands on a site with a long history for the community. Before becoming a Polindes, this location was the village hall office, which served as the centre of activities and events for the residents of Kresek Village. The village hall was once the hub of activity for the Sedie Jadi community, including religious activities and where residents sold their harvests. This place even became the precursor to the village cooperative because the villagers did not know where to sell their agricultural produce at that time, making the village hall the heart of village life.

The village hall also bore silent witness to the tragic events of June 5, known as the June 5 Tragedy. This event added to the historical and emotional significance of the location, giving the construction of the monument here a profound meaning. The memorial monument to the conflict victims, located in front of the Polindes, is depicted in Figure 1 as a tribute to those who fought and fell victim during the conflict.

The construction immortalized in the conflict monument in Sedie Jadi Village depicts the village community's struggle to defend their homes from attacks by unknown people who tried to evict them. The monument symbolizes the community's determination and courage in facing threats and reminds them of the importance of maintaining sovereignty and peace in their area.

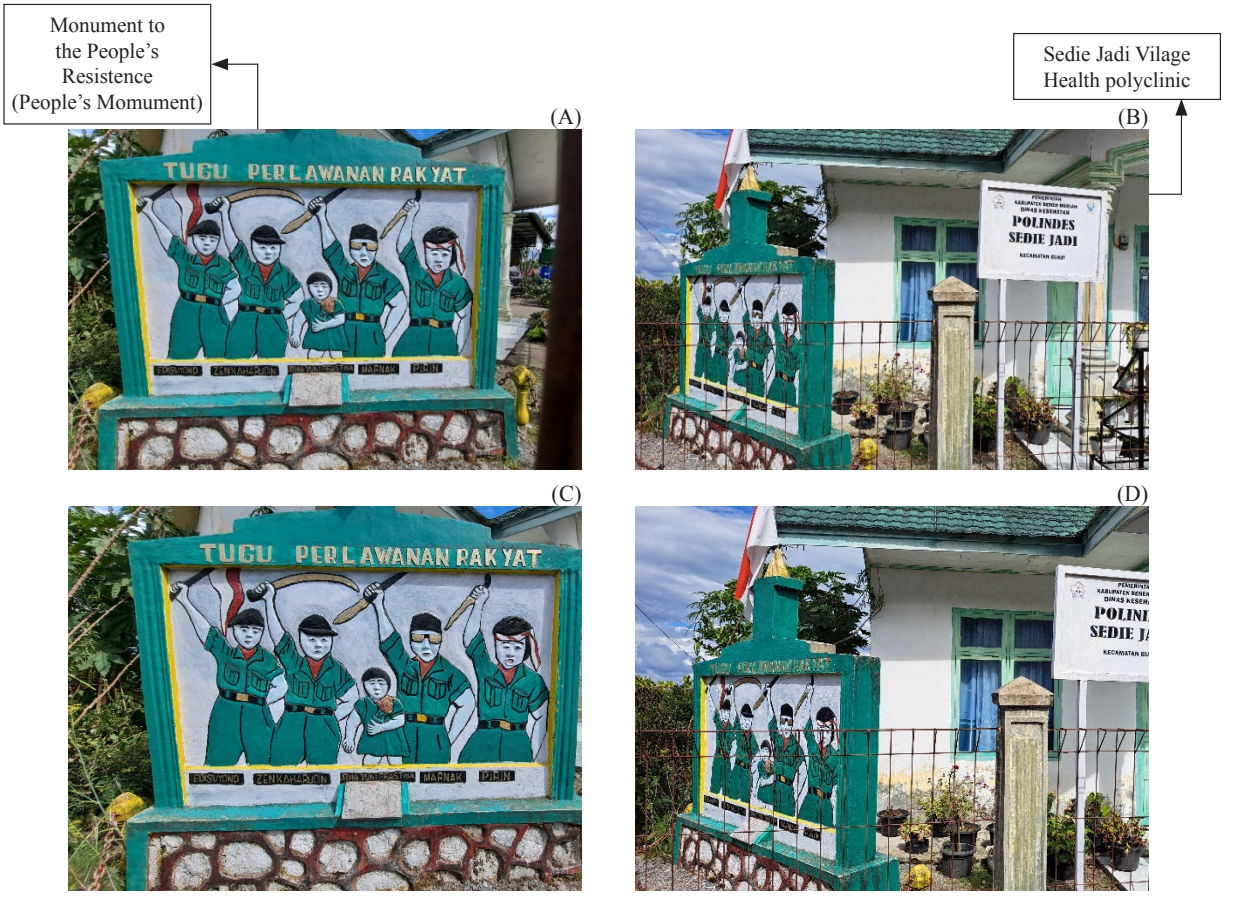

Figure 1 Memorial monument for conflict victims in Sedie Jadi Village, Bukit subdistrict, Bener Meriah Regency, Aceh. (A, B C, D are the same figure, taken from different angles.)
Source: Research team documentation, June 2024.

The conflict memorial monument in Sedie Jadi Village was built by Mr. Sahidi, a community leader and a direct witness to the June 5 tragedy, who has no formal art education. The monument was created manually and purely from the residents' initiative. Despite having only an elementary education, which he did not complete, Mr. Sahidi produced an artwork that beautifully reflects the victims with his remarkable strokes on the wall. The construction of the conflict monument was the result of an agreement between the village elders, village heads, and the community involved in the tragedy of June 5, 2001. Mr. Sahidi was the village elder who acted as the main implementer.

The green military uniform on the monument refers to the military uniform of the Republic of Indonesia, which signifies that the victims were part of the Republic of Indonesia. In addition, the color green also symbolizes the close relationship between society and nature and its struggle to defend its land and life. In the context of the monument, the color green represents the spirit of the people's struggle that remains alive and the hope for a more peaceful and prosperous future after going through difficult times of conflict. According to residents, Mr. Sahidi's artistic work on the June 5 tragedy memorial monument shows a striking resemblance to the victims, even though it was created without any technical knowledge or skills. This monument's beauty and emotional depth reflect the dedication and spirit of the Sedie Jadi Village community in remembering and honouring their history and struggles. This monument stands as concrete evidence that the spirit and initiative of the community can create something meaningful and valuable.

The monument serves as a tribute and a learning tool for the younger generation, children, and grandchildren of Sedie Jadi Village residents. Currently, the community of Sedie Jadi views the events that led to the establishment of this monument as a tragedy that must be a lesson to prevent similar occurrences in the future (interview with J).

Memorialization Practices at the Conflict Monument in Sedie Jadi Village

Information about the memorialization practices was obtained from in-depth interviews with the residents of Sedie Jadi. Every June 5th, the community of Sedie Jadi Village commemorates the tragic event that occurred on this day. This annual commemoration is a consensus agreed upon by all villagers to remember the tragedy and teach it to future generations. The decision to hold the annual commemoration was declared by Mr. Teguh Hardi, a highly respected elder and community leader of Sedie Jadi Village, and agreed upon by the villagers. Mr. Teguh Hardi was instrumental in the development and establishment of the village, thus holding an important and respected position among all residents. Whatever Teguh Hardi conveyed was always adhered to and obeyed.

Mr. Teguh Hardi has now passed away, but his mandate to commemorate the June 5th tragedy every year continues to be carried out with reverence. The tragic event on June 5th, which occurred at 10 pm, is always remembered by the residents as an important moment that must not be forgotten. The commemoration begins on the evening of June 4th with communal prayer and Yasin recitation after Maghrib prayers. On the morning of June 5th, villagers visit the graves of the victims who were buried close together as a sign of respect and solidarity.

The commemoration event involves almost the entire community of Sedie Jadi Village, both young and old. They gather at the village mosque for a communal prayer led by Mr Sutrisno, a former village head who played a crucial role during the incident. Before the communal prayer, Mr. Sutrisno delivers messages of wisdom to the residents as a reminder and lesson. After the prayer, the event continues with a communal meal, similar to a kenduri or pulutan, symbolizing togetherness and solidarity. The message conveyed by Sutrisno and the existence of the monument in Sedie Jadi Village has an important role in supporting the process of reconciliation and peace education. His message invites the community to remember the past as a lesson passed on to the next generation while focusing on strengthening harmony and peace. The monument itself not only functions as a visual symbol of a dark history but also as a reflection space for the community to gather, commemorate the victims and strengthen the commitment to maintaining peace in the future. In addition, the conflict monument in Sedie Jadi is an educational tool for the younger generation, who are invited to understand history without perpetuating hatred.

This commemoration event not only aims to remember the victims and pray for their safety but also to seek protection and pray that such a tragic event does not recur. These memorialization practices demonstrate the importance of the conflict monument and the annual commemoration in preserving the community's collective memory and passing on the values of wisdom to future generations.

The Role of Memorialization in Forming Collective Memory in Sedie Jadi Village

The monument in Sedie Jadi Village is not merely a physical structure; it holds the stories and memories of past tragic events. The effort to pass on these memories, particularly the positive ones aimed at maintaining peace, is an integral part of the community's life. Although the monument's ceremonial commemoration occurs every June 5th, the residents of Sedie Jadi Village also routinely maintain the monument and the victims' graves in their daily lives. Additionally, the monument is maintained on national holidays, reflecting its significant importance to the community.

The active participation of all community members, including the youth who help clean and monitor the monument, demonstrates the collective involvement in preserving this heritage. For outsiders, the monument might appear as just an ordinary structure, but it holds a deeper meaning for the local community. The hidden stories within the monument create a strong emotional connection with their history.

The annual commemoration, which is never missed, reinforces the community's collective memory. By continuously remembering and commemorating this event, the people of Sedie Jadi Village honour the past and preserve and pass on the values of peace to future generations. This monument, with all the stories and memories enshrined within it, plays a crucial role in forming and maintaining the collective memory of Sedie Jadi Village.

Continued peace efforts were carried out by involving a broader range of stakeholders with authority in the post-conflict reintegration process in Aceh. On Tuesday, March 29, 2022, the people of Sedie Jadi Village, Bukit District, Bener Meriah Regency, along with the Commission for Missing Persons and Victims of Violence (KontraS) Aceh, held a national reconciliation event that brought together various parties affected by the Aceh conflict 20 years ago. The event took place in the courtyard of the local village office and was inaugurated by the Bener Meriah Regency Government (interview with inf).

In this activity, reconciliation occurred between former combatants, represented by Fauzan Azima and Sutrisno, Sedie Jadi Village community representatives. The awareness of the importance of restoring good relationships encouraged the parties to agree to sit together and rebuild relations post-conflict. In addition to revealing the truth about what happened in the past, it is necessary to foster reconciliation between the parties involved in the conflict. This effort was carried out purely as a learning experience to emphasize the importance of sustaining peace, restoring the community's social fabric to its previous harmonious state, and preventing similar incidents from happening again.

Broader findings on the role of conflict monuments in Aceh can be seen through observations of various monuments spread across conflict-affected areas. Like the monument in Sedie Jadi Village, which was actively involved in efforts to build collective memory through the involvement of the local community, other monuments in Aceh can also function similarly if the construction process involves residents more directly.

Conflict monuments can be essential in supporting post-conflict reconciliation processes and peace education. However, to maximize their impact, active community participation is essential. The example of Sedie Jadi Village shows that direct community involvement in building and maintaining monuments results in a strong emotional attachment to the symbol. This impacts the use of monuments not only as places of commemoration but also as educational facilities for the younger generation to understand the importance of peace.

On the other hand, as seen in the case of the monument in Idi Cut, without solid involvement from the local community, monuments can lose their function as guardians of collective memory and become merely symbolic structures without deep meaning for residents. Therefore, it is essential for every conflict monument in Aceh, or other areas that have experienced conflict, to become an integral part of the social life of the community so that it can play its role in sustainably forming collective memory.

The Impact of Memorialization on Grassroots Reconciliation

The Conflict Monument in Sedie Jadi Village has become one of the village's most valuable assets and must be preserved. This monument is a symbol of history and an irreplaceable identity for the people of Sedie Jadi. Most of the villagers, 90 percent of whom are of Javanese descent, deeply understand the meaning and story behind this monument because it is commemorated every June 5th. The monument has become the foundation and existence of the Sedie Jadi community and the basis for the harmony that has been maintained to this day.

The residents of Sedie Jadi Village, 90 percent of whom are of Javanese descent, understand the meaning and story behind the monument deeply through their collective heritage and direct experience of past events.

In addition, the active involvement of the community in the construction and maintenance of the monument reflects a strong emotional connection to the story it immortalizes. The conflict monument in Sedie Jadi serves as an annual memorial to remember the victims of the conflict and as a means to pass on the values of struggle and peace to the younger generation. For the Javanese community in Sedie Jadi Village, this monument is a symbol of pride and an important reminder of the meaning of maintaining peace and building a better life post-conflict.

The presence of this monument has helped the Sedie Jadi community to blend with people from various backgrounds without limiting interactions to certain ethnic groups. The awareness that harbouring grudges will never solve problems has encouraged the community to improve relationships and foster harmony. Sedie Jadi Village is known as a cohesive community, with daily activities involving various groups, including women, men, and youth. This creates a conducive atmosphere and reduces the likelihood of negative activities among residents.

Previously, the village was known as Kampung Kresek, which is now the name of one of the hamlets under Sedie Jadi Village. Collectively, the memory of the tragedy that once occurred in this village has shaped a shared awareness to maintain peace. This sense of unity has been fostered and maintained by both the older and younger generations, although future challenges with advanced technology may erode the younger generation's attention to history and these values of wisdom.

This monument reminds the community of the past and provides valuable lessons on the importance of reconciliation and maintaining peace. The impact of this memorialization has strengthened social bonds at the grassroots level, creating a closer and more harmonious community. The effort to preserve this collective memory is a shared responsibility, ensuring that the wisdom formed from past experiences continues to be passed on to future generations.

A different situation occurs in the Idi Cut area, East Aceh Regency. In Idi Cut, East Aceh, a conflict monument was built to commemorate the Arakundo incident, part of the Aceh conflict, on February 3, 1999. This tragedy claimed the lives of 28 people, 8 of whom were found in the Arakundo River. The construction of this monument was initiated by the Aceh Reintegration Agency (BRA) of East Aceh, and every year, a commemorative ceremony is held normatively and organized by provincial council members. However, according to interviews with local informants, the monument does not fully represent the feelings or experiences of the local community, resulting in no active involvement of residents in utilizing or maintaining the monument.

This is in stark contrast to the conflict monument in Sedie Jadi Village, Bener Meriah, which was built through the initiative and active participation of the village community. The monument in Sedie Jadi is not only a symbol, but also serves as the center of annual activities involving all residents, commemorating the tragedy of June 5, 2001, and passing on the values of peace to younger generations. The main difference between these two monuments lies in the level of local community involvement, with the monument in Sedie Jadi functioning more as a tool for building collective memory and maintaining strong social bonds among residents. In contrast, the monument in Idi Cut is more formal and tends to involve less direct community participation.

Discussion

Memorialization through the monument in Sedie Jadi Village significantly impacts the formation of collective memory and the process of reconciliation at the grassroots level. So, why is this important? Memorialization is crucial in preserving the collective memory of past tragic events and using them as educational tools for future generations. By commemorating the event annually, the people of Sedie Jadi remember the victims and learn from history to build a more peaceful and harmonious future.

Memorialization also helps the village community avoid unproductive cycles of revenge by shifting the focus to learning from the past and strengthening social harmony. The community's current orientation is to build a better future in all aspects, both physically and mentally. The monument serves as a symbol of identity, reminding the community of the shared values built from their historical experiences. This shows that memorialization is about remembering the past and using that memory to shape future behaviour and policies.

Efforts in memorialization also involve the younger generation as part of the community's future to ensure that important values such as peace, solidarity, and harmony continue to be passed down. A younger generation that understands the monument's importance and history is more likely to become wise and empathetic policymakers. This is essential for building a more robust and more sustainable community.

Memorialization through the monument in Sedie Jadi Village significantly impacts the formation of collective memory and the process of reconciliation at the grassroots level. At least four aspects can be analyzed.

First, memorialization helps preserve the memory of tragic events. This collective memory provides an important historical context for the community, helping them understand the origins of the conflict and the suffering experienced. The monument serves as a powerful visual reminder of the past, ensuring that these events are not forgotten and remain part of the community's shared narrative.

Second, memorialization plays an important role in educating the younger generation. By understanding the history and values embedded in the monument, the younger generation can learn from past mistakes and work to avoid similar conflicts in the future. This education is not just about knowing historical facts but also about understanding the emotional and social impacts of these events and the importance of maintaining peace and harmony.

Third, memorialization helps shift the focus from revenge and hatred toward reconciliation and peace. By collectively commemorating tragic events, the community can process their pain together and find ways to move forward. The monument symbolizes hope and renewal, reminding the community that they can learn from the past to build a better future.

Lastly, memorialization provides a strong foundation for community identity. With the monument serving as the center of collective memory, the people of Sedie Jadi Village can build and strengthen their identity based on the values of togetherness, solidarity, and peace. This identity is essential for maintaining social harmony and ensuring that past experiences are used as valuable lessons for the future.

Memorialization through the monument can serve as an effective mechanism for preserving collective memory and promoting peace. The monument's existence is a physical structure and a symbol filled with historical and emotional significance. By commemorating tragic events every year, the people of Sedie Jadi Village succeed in maintaining awareness of the importance of learning from history. This monument helps the community not forget their painful past while using it as a valuable lesson to build a more peaceful and harmonious future.

Moreover, the monument serves as an educational tool for the younger generation. The youth involved in commemorating and maintaining this monument will better understand the importance of values such as peace and harmony. They can draw lessons from history and apply them in their daily lives and future policymaking. Thus, memorialization not only connects the community to its past but also prepares it for a better future. The monument also strengthens community identity. By having a focal point that reminds them of their shared history, the people of Sedie Jadi Village can build stronger solidarity and a sense of togetherness. This collective identity is crucial for maintaining social harmony and ensuring that the community remains united despite future challenges.

In the context of Sedie Jadi Village, this finding can be linked to the Collective Memory Theory developed by Maurice Halbwachs. According to this theory, collective memory is the result of social construction resulting from the interaction of groups and institutions. Memorialization through monuments in Sedie Jadi Village functions as a physical and symbolic device to remember traumatic events that have occurred, thus creating a space for the community to align their memories of the past. Monuments not only act as reminders of events but also as narrative containers where the community collectively formulates and maintains their memories. Through collective memory, it allows the Sedie Jadi Village community to stay connected to the tragic events of the past while also making it a foundation for formulating a vision of a more peaceful and harmonious future.

Meanwhile, in relation to the Theory of Reconciliation and Conflict Resolution, memorialization in Sedie Jadi Village can be seen as part of a conflict transformation strategy, as outlined by John Paul Lederach. Memorialization not only invites the community to remember traumatic events but also facilitates the reconciliation process by strengthening shared reflection on the pain experienced and commitment to building a more peaceful future. The monument as a memorialization center serves to shift the focus from revenge against the perpetrators to learning from history that emphasizes peace and reconciliation as a way out of the cycle of violence. In this process, the people of Sedie Jadi Village are involved in a collective healing process that allows them to strengthen social cohesion and improve relationships between community members, both vertically (intergenerationally) and horizontally (between individuals and social groups).

Conclusion and Recommendation

This article examines the role of memorialization in shaping collective memory at conflict heritage sites, focusing on Sedie Jadi Village, Bener Meriah Regency,

Aceh, Indonesia. The main issue addressed is how monuments and memorial sites can influence collective memory and contribute to post-conflict reconciliation processes.

Memorialization in Sedie Jadi Village, through the monument built to commemorate the tragic events of June 5, 2001, plays a key role in preserving collective memory. This monument not only serves as a visual reminder but also as an educational tool for the younger generation about the importance of peace and harmony. The annual commemoration and routine maintenance of the monument demonstrate the community's commitment to not forget the past and to use this collective memory as a foundation for building a better future.

This monument holds deep and multifaceted meaning for the local community. First, it serves as a historical reminder of the conflict experienced by the Javanese ethnic group in Central Aceh. The monument stands as a tangible testament to the tragic events that affected the community, reminding everyone of the hardships and suffering they endured. Second, it serves as a tribute to the five victims who lost their lives in the incident. The presence of the monument ensures that their sacrifices are not forgotten and provides a place for the community to gather and remember them each year. Third, it acts as an educational tool for the youth. Through the monument, the younger generation is taught the importance of understanding history and learning from the past. The monument symbolizes the hope that similar conflicts will never recur in the future.

Memorialization monuments serve a dual role as historical symbols and reconciliation instruments. The conflict memorial in Sedie Jadi Village helps shift the focus from revenge and hatred towards learning and peace. By commemorating the events annually, the community strengthens their collective identity and builds stronger solidarity. This discussion also highlights the importance of involving the younger generation in memorialization efforts to ensure that the values of peace and harmony are continuously passed down.

The findings of this study indicate that the practice of memorialization in Sedie Jadi Village has a significant impact on strengthening collective identity and promoting peace. These findings differ from previous studies that have focused more on the short-term impacts of memorialization. This research reveals that through the active involvement of the community in maintaining the monument and annual commemoration, the collective memory of the conflict events and the values of peace can be sustained and passed on to future generations.

In comparison with previous studies, such as those conducted in Germany, Rwanda, and various other places, this research emphasizes the importance of the local context in understanding the dynamics of memorialization. While the Holocaust monuments in Berlin and the Kigali Genocide Memorial Centre serve as powerful national symbols, the monument in Sedie Jadi Village shows how memorialization can effectively function at the community level by involving active participation from local residents.

The implications of this research are crucial for the development of future memorialization policies and practices. Governments and other stakeholders need to consider encouraging community participation in the memorialization process and ensuring that monuments do not only serve as static symbols but also as dynamic tools for education and reconciliation. Furthermore, further research is needed to examine the long-term impacts of memorialization on collective memory and reconciliation, as well as to develop more effective strategies in different local contexts.

This study underscores the importance of understanding how memorialization can transform conflict into reconciliation through the formation of collective memory at heritage sites. This research is significant and urgently needed to explore the crucial role of monuments and memorial sites in supporting reconciliation processes and maintaining peace in communities that have experienced conflict.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Public service delivery under the new public governance framework of Mae Hong Son town municipality

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Abstract

This qualitative research aims (1) to study the city management model under the new public governance concept of Mae Hong Son Town Municipality, (2) to investigate the democratic values of the officials of Mae Hong Son Town Municipality and its network, and (3) to draw lessons from public governance that could make it a prototype for similar municipalities. This study employs data from documentary analysis, semi-structured interviews, and non-participatory observation. The results of the study clearly show that Mae Hong Son adopted the "smart city" model as a direction for city management by utilizing resources and technology. Utilizing technological innovations that make Mae Hong Son a smart city comes under democratic value enhancement. To promote democratic values in local governance, the municipality created conditions for effective participation by allowing the people to easily access the municipality's databases. The municipality relies on collaboration with its governance network in integrating with its works to support and utilize the resources of each partner. The strengths of Mae Hong Son Municipality come from collaboration between the municipality and its partners, which begins with intimate clan relationships and cultural capital. The limitations that affect the delivery of public services under the new public governance of Mae Hong Son Municipality are the lack of understanding and competence of the people, and the low level of independence in administrating the work of the municipality.

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Introduction

The public management concept, which emphasizes the governance network for formulating and driving public policy, comes from the governance concept formulated around 1980, before it was developed into new public governance. This concept is rooted in organizational sociology and network theory and focuses on the processes and outcomes of public service delivery through inter-organizational governance, emphasizing citizen participation (Osborne, 2006, p. 383). It is focused on the process and outcome of public service delivery under inter-organizational governance. In order to foster participation from citizens, some responsibility must be devolved from central to local government, and spaces should be opened for a wider and deeper participation of citizens at the local level (Silverman et al., 1996).

The decentralization from central authorities to local governments means that power is transferred from the central government to local bodies. Decentralization will empower local authorities to make decisions on their own. In Thailand, however, the authority from centralized bureaucracy has been distributed in a limited way in functional, budgetary, and administrative dimensions. The local administration, therefore, is not autonomous enough to make its own decisions and it cannot respond to the local problems under the local context (Chardchawarn, 2019; Charoenmuang, 2006).

It is believed that an administration under the New Public Governance concept can enhance the local administration's ability to deliver public services. The administration under this concept will create opportunities for everyone to take part in the policy formulation and implementation process. An administration that conforms to the principles of participatory governance can strengthen the democratic culture of local people. It also enables the local administration to solve complex problems that cannot be solved easily by a single entity. Network governance can mobilize the workforce, resources, and ideas. It, therefore, creates more tendencies for the success of the local administration. Collaboration for community benefits requires boundary spanning and inclusiveness, that is, carrying out public purposes by engaging a wide net of participants, including public-private and nonprofit (Dzigbede et al., 2020, p. 642).

The municipality is the smallest local self-government form that can increase varieties of participation. One of the major participants of Mae Hong Son Town Municipality's governance is the community. The researcher found that Mae Hong Son has cooperated with the community and its people to operate public services, such as the Municipality Market, the Learning Center, and the Living Museum. (Hereafter, "Mae Hong Son" refers to the town, not the province, unless the province is specified.) This governance network has tried to conserve the way of life and culture of the Tai Yai ethnic group (Research Center of Mae Hong Son Community College, 2022). It also extends its network to other organizations, such as education institutes, independent organizations, and other local governments. According to administrative law, Mae Hong Son Town Municipality must deliver public services within its boundaries. By driving its work, the municipality has cooperated with many public organizations and communities. The rewards and other recognition that the municipality administration has received can affirm that the network governance of Mae Hong Son had succeeded in achieving its goals (Cmthainews, 2021; Mae Hong Son Town Municipality, 2022).

The objective of this research is to learn lessons about the network governance of Mae Hong Son, as follows: (1) to study the city management model under the New Public Governance concept of Mae Hong Son Town Municipality, (2) to investigate the democratic values of the staff of the municipality and its network, and (3) to draw lessons from the municipality's public governance, which can be a prototype for similar municipalities. This study will also propose suggestions for developing other municipalities and bringing about participatory democracy, in which everyone can participate and benefit from the administration of the municipality's network.

Literature Review

The Concept of New Public Governance

Osborne (2006) proposed the New Public Governance concept, which is rooted in organizational sociology and network theory (Osborne, 2006, p. 383). It emphasizes the process and the result of the public service under inter-organizational governance and includes cooperation with the people. This concept of governance was established in 1980 after the new public management concept had been widely applied to the public sector, from 1970 to 1980. A new definition of the state was presented, which changed from emphasizing

the government to emphasizing governance instead. This concept appeared in publications of the public sector, funding organizations, and academics (Mathur, 2015, p. 1). According to the 1992 Development Report of the World Bank, Western countries had tackled the fiscal crisis caused by social welfare policies and bureaucracy expenditures. The crisis, therefore, led to the concept of privatization and liberalization, which experts believed could bring efficiency to administration bodies (World Development Report, 1992, p. 4–11) As a result, The role of government changed from doing everything to enhancing public-private partnerships, collaboration, stakeholder involvement, and citizen involvement (Klijn, 2012).

New Public Governance has a characteristic of policy implementation that is different from the New Public Management, whether in cooperation, coordination, or integration dimensions with public partners, such as the private sector or the public sector stakeholders. It is linked through the cooperation network (Fierlbeck et al., 2018). New Public Governance requires cooperation between different sectors, particularly the communities and democratically minded citizens.

Participatory governance has changed the operation of the public sector, as well as the roles of the people. It also improves the public's role from a level of consultation to a partnership level (Goetz & Gaventa, 2001, as cited in Siroros, 2014). Participatory governance has some special characteristics that are different from other forms of administration, as it is a style of administration in which everyone, particularly the marginalized, can participate. To maintain people's participation, the local administration should restructure its organization into a horizontal structure, change the working habits of the officials by creating a working manual, and develop training (Siroros, 2014, pp. 280–281). The officials of the local administration should have relevant values, to be able to respond to the needs of the community and strengthen the cooperation of the people under the New Public Governance model.

Nowadays, most organizations are creating networks with various self-management members, which are controlled by many coordination centers, to satisfy their working needs. To do so, it is necessary to design a horizontal work team, empower the staff, and support them with information technology and continuous improvement (Boje & Dennehy, 2000, as cited in Lorsuwannarat, 2018). Network organizations have been established rapidly for public policy-making, business, and civil society operations.

New public governance concept and public values

To reach public management goals for the public interest, it is necessary to encourage the community to participate in local government administration. Robert Putnam studied 20 local administrative organizations in Italy and described them in the book *Making Democracy Work: Civic Traditions in Modern Italy* (1993). He found a relationship between social capital and economic performance. According to Putnam's (1993) study, the local administration in the north of Italy had been successful in fighting against corruption because of the horizontal relationship between the local government and the people, while there was widespread corruption and mafia influence in the south. The reason was that in the southern part of Italy, there was a low level of public participation (Putnam, 1993).

It can be said that strengthening social capital can inflate the level of local management participation. Putnam (2000, p. 19) defined "social capital" as strong relationships between individuals and social networks, and the norm of reciprocity. It also refers to a form of trust that grows from social capital. Social capital is similar to civic virtue and has a close relationship with political participation. It is based on individual relationships, while political participation relies on political institutions (Putnam, 1995, as cited in Häuberer, 2011). Pierre Bourdieu was the first academic who applied the work of social capital since 1984 to explain that there are two dimensions of social capital: the network connection linkage and mutual purpose (Ganchanapan, 2021, p. 2).

In addition, there is formal and informal social capital. Putnam (2000) explains that social capital can be divided into 1) "bonding social capital," which means a close relationship of assorted people or the same group of people, and 2) "bridging social capital," which is a loose relationship between people with different identities, such as nationality, religion, and language (Putnam, 1993; Putnam, 2000; Szreter & Woolcock, 2004). Putnam (2000) further explains that nowadays an informal social capital is more important than the result of an assembly of the associations. Putnam's (2000) study shows that several activities are dramatically reduced, while, in Putnam's (2000) viewpoint, doing good things for others is not a part of the definition of social capital (Putnam, 2000). Regardless, in the United States, as in other places, it is found that doing good for others is connected to a social linkage. Social capital can refer to characteristics of social organization, such as a network, norm, and trust, which will lead to coordination and cooperation for mutual benefit. Social capital enhances the benefit of both physical and human capital investment.

Social capital is compatible with what Tom Wolfe (1987, as cited in Putnam, 1993) called the "favor bank" in his novel *The Bonfire of the Vanities*. This shows that a caring and sharing society will create more efficiency than a loose culture in which people lack trust in each other, as trust can nourish a social life (Putnam, 1993).

The case of Mae Hong Son may be different from others, as most of the people in Mae Hong Son are in the Tai Yai ethnic group, adhering to the Buddhist culture and traditions. This leads to many cultural festivals that can unite people and create cultural and social capital. Finally, these cultural activities can strengthen the civil society and create co-optive power.

Methodology

The study employed qualitative research, using documentary analysis, semi-structured interviews, and non-participatory observation. Data triangulation, using various data sources, was used to improve the accuracy and reliability of the findings

Target Group, Key Informants, and Data Collection

The target group in this study was the members of the governance network, composed of the members who play a crucial role in delivering public services in Mae Hong Son Town Municipality, such as the administrators and the officials of the municipality, government officials at the regional level, other public organizations, civil society organizations, and six communities in the municipality. Documents from the announcements, orders, memorandums, and other municipality documents were analyzed under the concepts listed in the research framework. Non-participatory observation was applied to investigate the social context of the people in the communities and their activities at the community center. The inclusion criteria of the key informants, for the semi-structured interviews, were willingness to participate and participatory experience in the public service delivery process of the municipality. The 25 key informants came from the following groups: (1) The administrative staff of Mae Hong Son, such as the mayor, the former mayor, and several administrative officials; (2) Government officials at the regional level, such as the Provincial Office for Local Administration, head of the Community Public Health Department of Srisangwan Hospital, head of the Policy and Plan Department of Srisangwan Hospital, deputy director of Srisangwan Hospital, and the former head of public relations of Mae Hong Son Province; and (3) Representatives of civil society, a member of the municipality, and two representatives from each community.

Data Analysis

The study used qualitative analysis with analytic induction and typological analysis to analyze data from semi-structured interviews and non-participatory observation. Content analysis was used as a systematic method to analyze and interpret the content of textual data. Framework analysis was conducted using the spreadsheet technique to manage and analyze data. Ethical approval for this study was obtained from the Ramkhamhaeng University Institutional Review Board (Approval Number RU-HRE 65/0006).

Results and Discussion

City Management Model under the New Public Governance Concepts of Mae Hong Son Town Municipality

It was found that Mae Hong Son Town Municipality adopted the model of a "smart city" as a direction for city management. In delivering the service in a democratic manner, the New Public Governance Concept was applied to increase people's engagement and achieve its goal of providing public service. The city's achievements, therefore, show that the model is suitable for other municipalities.

Public governance and "Smart City"

In general, there are seven facets of a smart city: (1) Smart Environment, (2) Smart Mobility, (3) Smart Living, (4) Smart People, (5) Smart Energy, (6) Smart Economy, and (7) Smart Governance (Working group members for driving and administrating Smart City Project, 2020). The municipality, however, determined that it had eight facets, which were congruent with the context of Mae Hong Son, a small city with a traditional way of life: (1) Smart Event, (2) Smart Travel, (3) Smart Health, (4) Smart Living, (5) Smart Energy, (6) Smart Environment, (7) Smart Office, and (8) Smart School. Many of the activities of the smart city are related to the perceptions, understanding, and collaboration of the network participants.

Political scientists and urban planners came up with the smart city concept primarily for the following reasons: (1) to solve problems of big cities in which the rate of population growth is significantly increasing, (2) to efficiently utilize the resources of the city, and (3) to achieve sustainable growth. Advanced technology, therefore, has been applied, so that the urban community will be inclusive, liveable, and sustainable (Singapore Global Center, 2022). The utilization of technological innovations that will make Mae Hong Son a smart city comes under democratic value enhancement. A process of operation that dovetails with democratic values will be compatible with openness and inclusiveness as the people can easily access the databases (Denhardt & Denhardt, 2007 ; Rossmann & Shanahan, 2012, pp. 56–67). Information technology will be applied in smart offices and can enhance the people's ability to connect rapidly with the municipality. This can also improve the municipality's response to the issues that arise.

The participants in the Mae Hong Son Municipality Network are composed of communities, government offices, business enterprises, and other local government organizations. There are six communities, namely, (1) Pok Don Chedi, (2) Pok Pang Lor, (3) Pok Kard Kao, (4) Pol Klang Wieng, (5) Pok Nhong Chong Kam, and (6) Pok Tawan-ok. According to the geographical and demographic conditions, Mae Hong Son is considered a small city in a shallow basin surrounded by a mountainous area. The economic activities are concentrated in the city, rather than in the other parts of the province, and the population is dense in the central area, which is quite different from the surrounding area. The people in the municipality are, therefore, connected and can communicate directly with the municipality's administrative office in several ways: through the representatives, by attending a public forum, or by communicating through social media. The decision-making that is related to public services, including the smart city model, is initiated by the values and beliefs of the municipality administrator. The people can take part only at the information level, rather than at the consultation or collaboration level, which means that this is only one-way communication. Consequently, the people are not empowered to cooperate or make public service decisions (Natbatchi, 2010). Eventually, the ultimate power to make decisions about public services belongs to the administration of the municipality.

In driving Mae Hong Son under a smart city model, it is necessary to improve the competence of the network members, especially the civil society; accordingly, the people should be able to coordinate with the municipality under the co-production system. Currently, each community's representative can participate under co-commissioning, owing to limitations from rules and regulations. Nevertheless, to mutually develop better cooperation, it is essential to strengthen the network parties so that they can access the databases.

Network members and the local development plan

Mae Hong Son Town Municipality has implemented its projects under the regulations of the Ministry of Interior regarding the *Development Plan of the Local Administrative Organization* B.E. 2548 (2005), (2nd Amendment Act) B.E. 2559 (2016), and (3rd Amendment Act) B.E. 2561 (2018). To comply with the ministry's regulations, the municipality must be aware of people's participation and empower the community's representatives to participate as a committee. The officials collect each community's plan and combine them to create a local development plan. This plan will be endorsed by the Mae Hong Son Town Municipality Development Committee. Afterward, the administrator of the municipality will approve it. Consequently, the community can participate in the planning process either by presenting their demands or allowing their representative to consider the plan with the Municipality Development Committee.

Understanding democracy by participating will create civic consciousness and it will be the beginning of enhancing democratic culture. The municipality, therefore, opens opportunities for the people who are affected by the projects that are created by the municipality to participate in the process of monitoring, scrutinizing, and giving feedback to the municipality. To reach the smart city goal, the municipality must develop a system that anyone can access and provide feedback in a short time. The feedback from everybody should be considered open data that other members who live in the municipality area should acknowledge, and they would use those data to inspect the work of the municipality. It is also important to improve the competencies of the elderly, as the number of elderly citizens is increasing dramatically in Thailand's aging society, as in other countries. The elderly are sometimes more active and interested in what is happening than other groups, but they do not take advantage of the telecommunication system.

If the municipality is independent from the direction and control of the centralized government, it is believed that the people in the municipality will be able to participate in creating a development plan relevant to

the municipality's context. This will, therefore, encourage every group of people to engage more, as they will realize that people's participation will bring better public services and correspond to their needs.

Governance network in delivering public services

According to the study, it was found that the municipality has several main partners who take part in providing public services, especially education and public health. However, Mae Hong Son Town Municipality is a city of culture. The municipality has cooperated well in organizing cultural activities with every partner. It encourages all the communities to promote culture-related activities to present the identity of the people of Mae Hong Son. The study found that the municipality collaborates with various partners through a Memorandum Of Understanding (MOU). However, it was also found that an MOU is only a formal activity for achieving the key performance indicators of a governance network, and many times, after signing an MOU, the municipality collaborates with other partners, even those without an MOU. The partnership of the governance network in delivering a public service usually begins with an informal relationship or comes from a social network of municipality leaders. It was found that the characteristics of the present mayor of Mae Hong Son Municipality (for example, he was born in and lives in Mae Hong Son; he is relatively young and has great enthusiasm to work; people can easily contact him; and he has a good social network) result in good participation from the people and other organizations. The study found that most of the active citizens who participate in community activities are the elderly. It is apparent that social capital arises based on informal relationships between the town's administrators and other partners. A close relationship between related groups or people in the same group, called "bonding social capital" (Putnam, 1993), creates trust and other forms of cooperation between the municipalities and their partners. However, limited authority, along with the independence of the municipality, may result in restricted development of a new form of public services that aims to respond to present-day public issues (Laothamatas, 2000, as cited in Chardchawarn, 2019).

Democratic Values of the Officials and the Governance Network of Mae Hong Son Municipality

Democratic values and public service delivery

Democratic values are values that the officials and governance network of Mae Hong Son Town Municipality must apply when delivering public services. From the people's point of view, these values are related to their awareness and willingness to participate in the public service of the municipality. The study has found that the public values of the administrators, the officials, and the governance network are openness and inclusiveness (Denhardt & Denhardt, 2007). Openness is composed of (1) access to information and (2) transparency of the process, while inclusiveness has two meanings: (1) representative and (2) participation (Rossmann et al., 2012, pp. 56–67).

According to the study, administrators and the governance network create many channels, including a public forum where people can give feedback and comments to administrators. This is considered an open local administration, in which people can access the information they need, and the administrative process is also transparent. Each community selected their representative to be on the municipality's planning committee. The local administration holds democratic values because the municipality must follow the regulations of the Ministry of Interior. As Mae Hong Son is a small city, the business area is concentrated at the center of the town, and the people have good informal relationships, which means that the municipality, therefore, receives good cooperation from its partners. These factors lead to success in delivering public services to the people. It was found that Mae Hong Son is unique in driving participatory governance by using its culture and tradition under the concept of New Public Governance, as social capital depends on the relationships between people (Putnam, 1995, as cited in Häuberer, 2011). Even at present, gatherings in the form of associations are less important, while informal social capital is more crucial. Network relatedness contributes to cooperation and collaboration (Putnam, 1993). The municipality relies on collaborations with its governance network in integrating with its works to support and utilize the resources of each partner.

On one hand, integrating between partners of Mae Hong Son Town Municipality is possible without any difficulty because of the uniqueness of the city; on the other hand, the municipality encounters a particular obstacle in creating democratic values for the people. Mae Hong Son is far away from other provinces; the town's people, therefore, have a slow life and concentrate mainly on their daily activities. Many of the people are rather passive and do not engage in social movements or demand any changes from the municipality or larger public organizations. They usually cooperate with the municipality in participating in cultural activities

rather than demanding better public services. Since the younger generation has educational opportunities to study in universities in big cities such as Chiang Mai or Bangkok, many of them decide not to return to Mae Hong Son after their graduation. Instead, they prefer to settle in prosperous cities to have a better quality of life. Consequently, Mae Hong Son is developing relatively slowly, compared with other towns. A report shows that Mae Hong Son Province had the fifth-highest number of poor people in Thailand from 2014 to 2020 (Isranews, 2022). The way of life of the people in the municipality is not always in line with democratic values, and this obstructs democracy. Moreover, the people in Thailand did not have a chance to vote for their local representatives for seven years after the coup in 2014. It interrupted the linkage between the people and the municipality leaders as their representatives.

In an ideal situation, a good external environment, especially a healthy political environment, usually strengthens democratic values. The openness and creation of a collaborative ambiance should lead to efficiency and effectiveness in creating democratic values. The municipality should be able to exchange and create database linkages to support their work and achieve their objectives. It was found in this study that Mae Hong Son has been able to increase channels to communicate and receive feedback from its partners. It has changed the authoritative political culture that is normally found in centralized bureaucracies (Bowornwathana, 2010; Jittaruttha, 2016).

The researcher found that, even though the municipality created more channels to communicate with the people, the officials communicated only to inform the people about various things. This can be regarded as one-way communication. However, the municipality tried to encourage the members of the community to express their demands by presenting project proposals to the municipality. Doing this may enhance the people's desire to take part in public service delivery (Nabatchi, 2010). The municipality has tried to provide resources for running community projects that meet people's needs. However, only small projects can be initiated with the limited budget allocation. It, therefore, cannot solve big problems or have a high impact on the community, so the budget is used for administrative purposes. However, the municipality's support may eventually motivate the people to join and create democratic values that focus on openness and inclusiveness.

Lessons from Public Governance that could make It a Prototype for Similar Municipalities

Strengths of Mae Hong Son municipality in the new public governance

The collaboration between Mae Hon Son and its partners begins with the intimate, clan relationship and cultural capital. In addition, the people, the municipality officials, and other partners always have opportunities to communicate with one another. Consequently, all partners are well informed about the municipality's public service delivery. Moreover, the cultural identity of the local people regularly gives rise to many activities that reflect the people's traditions and culture. It is, therefore, a chance for the community, businesses, and civil society to interact with the municipality.

Limitations of Mae Hong Son municipality in the new public governance

There are two main limitations affecting the public service delivery under the New Public Governance of Mae Hong Son Municipality.

The first is the lack of understanding and competence of the people. Even though the municipality receives good cooperation from almost everyone in this small city, the deliberation process is very restrictive, as the political culture of the people here is not congruent with democratic values. They do not dare to criticize the work of the municipality. Therefore, the local policy comes from politicians and bureaucrats, not the people. Consequently, the people have less chance to monitor and give feedback to the local administration. Moreover, as the more active citizens of Mae Hong Son Municipality are seniors, they are not capable of utilizing smart devices to access current issues and information.

The second is the low level of independence in administrating the municipality. It is necessary to decentralize administrative authority from the central bureaucracy to the local administration. It is believed that the local administration can access the demands of the people and can formulate a policy that follows the local context (Chakrabarty & Chand, 2016, pp. 261–266). The municipalities in Thailand cannot autonomously administer their duties, even though the decentralization policy was launched in Thailand in 1992. The municipality does not have the right to independently manage its human resources, including manpower planning, determination of job specifications, recruiting staff, and the like. The regulations and policies from the centralized administration obstruct

the municipality from formulating innovative policies that could respond to the needs of the people. In addition, the fiscal budget of the municipality must be determined in consonance with the centralized regulations. The municipality does not have fiscal independence and cannot increase the proportion of revenue collection by innovating a new source of revenue.

Recommendations

Policy Recommendations

1. In managing the municipality under the New Public Governance concept, flexibility and agility are needed. It is also necessary to deregulate the centralized rules and regulations and to empower the municipality to make decisions and design its practice to follow its identity and the way of life of the people in the city. The municipality should, therefore, collaborate with other public partners under the co-management concept. The municipality should also be able to create resource planning and administer necessary tasks freely to reduce the cost of providing public service. If the municipality is empowered to create a new source of revenue, the municipality can respond to the needs of the people, strengthen the collaboration of the people with the municipality under the co-management scheme, and bring sustainable development to Mae Hong Son Municipality.

2. It is necessary for participants in municipal administration to access and utilize the same set of databases, which is the principle of "open data." Afterward, they can integrate plans and create cooperation to achieve the goals efficiently and effectively. Creating an open data information system is crucial in delivering public service under a smart city development model. In this way, learning by participating can enhance democratic values.

3. The social capital and identity of Mae Hong Son Municipality come from the cultural capital. The people are close to each other, and this strengthens the bonds of the people in the community. The urbanization of Mae Hong Son, together with the progress of information technology, could be an imminent threat. Therefore, attracting the younger generation to return after university is necessary, which would help conserve Mae Hong Son's identity. Accordingly, the municipality should create attractive and modern activities to encourage young people to take part with the seniors in driving the community's work.

4. In the long term, the municipality should widen its cooperation with other partners in seeking guidelines for economic development. Infrastructure and human resource planning are needed to support development in many dimensions, including promoting investment that is relevant to the people's needs and the area's identity, such as a green business model, to motivate young generations to return home after their graduation.

Operational Recommendations

1. In collaborating with other partners to achieve the goals, it is necessary to attach an annex to MOUs to show the role of each party and to define the resources that will be allocated in the implementation of the collaboration.

2. The municipality can improve the level of participation to comprise all the people by using what the municipality has already offered, such as setting up an information technology center to provide free access to the Internet. The online platform will show the plans, projects, and activities that the municipality has done during each fiscal year. The people are encouraged to give feedback to the municipality through that platform, which is an example of open data.

3. The municipality should promote democratic values by consistently organizing public forums to create a deliberation process and allow people to negotiate with everyone in the municipality. The mutual agreement will be followed up by an implementation process, which is a crucial element that can strengthen civil society through learning by doing.

Recommendation for Future Research

Future research could further examine the social capital of the people in Mae Hong Son Town Municipality and study guidelines for developing a new business model to enhance its economics.

Conflicts of Interest

The author declares that there is no conflict of interest.

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Evaluation of policy in turtle protection in the Nagari Ampiang Parak, West Sumatra Province, Indonesia

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Abstract

This research aims to describe the results of an evaluation of the Nagari Ampiang Parak government policy on protecting turtles. This research was conducted at the Turtle Conservation Partners location in Nagari Ampiang Parak, Sutera District, Pesisir Selatan Regency. This research was processed using qualitative analysis techniques, descriptive methods, and data collection through observation, interviews, and documentation studies. The research results show that the evaluation of the Nagari Ampiang Parak government in turtle protection can be concluded as a whole, and its implementation has not been optimal. One of the six indicators has been achieved well: policy alignment. Meanwhile, the effectiveness, efficiency, adequacy, accuracy, and responsiveness indicators have not been achieved well because their delivery and socialization have not been optimal. In the future, the government must focus more on optimizing policy implementation.

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Introduction

An investigation into marine biodiversity has determined that turtles encounter the most significant risk of defaunation (McCauley et al., 2015). Within conservation biology, sea turtles are regarded as pivotal emblematic species, inhabiting tropical and subtropical regions and utilizing diverse habitats throughout their life span. They play an essential role in marine ecosystems, especially coral ecosystems. Still, they are threatened by the increasing effects of land-use change, pollution, and global warming (Kelly et al., 2017), with decreased populations worldwide (Mahbub et al., 2020; Razaghian et al., 2019). The IUCN red list categorizes turtles as follows: endangered (Mancini & Phillott, n.d.; Mortimer & Donnelly, 2008; Wibbels & Bevan, 2019), susceptible (Abreu-Grobois & Plotkin, 2008; Nel & Casale, 2015; Wallace et al., 2013) and lack of data (Mahbub et al., 2020).

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Sea turtles face a series of threats in their terrestrial and marine habitats (Jackson et al., n.d.; Lovemore et al., 2020; Pauly et al., 2005; Wallace et al., 2010). Consequently, they are listed as vulnerable, endangered, or critically endangered by the International Union for Conservation of Nature (International Union for Conservation of Nature [IUCN], 2019; Lovemore et al., 2020).

Turtles are migratory species that require global handling steps and commitment from many countries, one of which is the leading country. Judging from the international trade convention, starting from CITES wild flora and fauna, including turtles, in the appendix I list, this can mean that global trade with these species is no longer allowed. The culling has impacted many turtle nesting sites globally (Hecht et al., 1999; Brost et al., 2015; Butler et al., 2020; Engeman et al., n.d.,; Engeman et al., 2005; Hof et al., 2020; Lei & Booth, 2017; Whytlaw et al., 2013) and is likely to continue and in the future expansion of coastal development can increase predation since action can limit the availability of food for their different forcing fauna seek alternative food sources, which may result in predation of the ocean turtle nests (Barton & Roth, 2008; Engeman et al., n.d.; Engeman et al., 2005; Gompper, n.d.; Lamont et al., 1998.; Lovemore et al., 2020.; Halim Iskandar, 2022; Kasenda et al., n.d).

According to (Ario et al., 2016), the turtle is one of the animals whose population level is decreasing yearly. The decline in the turtle population can disrupt the balance of the marine ecosystem. All types of turtles are included in the threatened species category and the IUCN red list, meaning they are threatened with extinction. Turtles play a role in maintaining the stability of seagrass habitats and distributing nutrients in the waters, including supporting the abundance of fish diversity, a source of protein for humans. Furthermore, (Ario et al., 2016) explained that conservation is one of the activities expected to prevent the extinction of turtle habitat, avoid the use of turtles for commercial purposes such as selling eggs, meat, and shells, and can be a means of various knowledge or education to the public at large. Implementing conservation area management aims to maintain environmental ecosystems and marine life, increase fish resources, and preserve the Environment in coastal areas (Ratih, 2013).

In many cases around the world, the role of local communities is considered necessary in the conservation of natural resources (Ancrenaz et al., 2007; Campbell, 2007; Mejías-Balsalobre et al., 2021; Risien & Tilt, 2008). However, Community involvement can sometimes be one of the most significant conservation challenges, especially when people have different attitudes toward using these resources (Barrios-Garrido et al., 2019; Heinen, 1993; Mejías-Balsalobre et al., 2021). A positive attitude towards biodiversity conservation is essential for the success of community-based conservation projects (Infield, 1988; Mejías-Balsalobre et al., 2021; Vannelli et al., 2019). However, a positive attitude is not guaranteed positive behavior (Friedrich et al., 2014; Kühl et al., 2009; Liu et al., 2011; Mejías-Balsalobre et al., 2021), even when communities directly benefit from the conservation of natural resources (Ineld & Namara, n.d.; Mejías-Balsalobre et al., 2021; Young, 1999).

One of the sub-districts in Pesisir Selatan Regency is Sutera Subdistrict, Nagari (Village) Ampiang Parak, which is still operating in managing and protecting turtles through community participation with members of a Conservation Youth Organization, formed in 2013 under the auspices of the Nagari Ampiang Parak government, Fisheries Service of Pesisir Selatan Regency, the Marine and Fisheries Service of West Sumatra Province, and Coastal and Marine Resources Management Center.

West Sumatra has 7 (seven) Regional Marine Conservation Areas (RMCA) located in 7 (seven) Districts/Cities in the coastal area, namely, Padang, Pariaman City, Padang Pariaman Regency, Agam Regency, Pesisir Selatan Regency, West Pasaman Regency, and the Mentawai Islands Regency. In this RMCA area, animal protection and conservation activities and coastal and marine ecosystem conservation activities are carried out. Turtle breeding has a combined concept of conservation and tourism. This turtle breeding area accepts tourist visits and releases hatchlings for visitors. There are 4 (four) turtle breeding locations in West Sumatra, namely, Padang City RMCA, Pariaman City RMCA, Padang Pariaman Regency RMCA, and Pesisir Selatan Regency RMCA. In Pesisir Selatan Regency, the location is on Karabak Ketek Island.

The role of the community in the management and protection of turtles in coastal areas is united in a Pokmaswas organization, with the Environmental Youth Group (EYG) formed in 2013 under the auspices of the Wali Nagari Ampiang Parak, the Pesisir Selatan Fisheries Service, the West Sumatra Provincial Marine and Fisheries Service, and the Coastal and Marine Resources Management Center of Padang City. EYG is a government partner in supervising and maintaining marine and fisheries resources supervision, as stipulated in Law No. 31 of 2004 concerning fisheries, article 67, where the article states: “the community can be involved in helping to supervise fisheries.” Then, the Policy of

the Head of Nagari Ampiang Parak No. 4 of 2019 emphasizes that the objectives of turtle protection in Nagari of Ampiang Parak are: first, Protecting turtles in the nesting beach area of Nagari of Ampiang Parak and second, maintaining the turtle population on the nesting beach of Nagari of Ampiang Parak to achieve balance, harmony, and sustainability and third, preventing, overcoming, and restoring the turtle population from illegal exploitation. Fourth, there was growing public concern and awareness about protecting turtles in Nagari of Ampiang Parak.

Some of the problems found in implementing this turtle protection policy are as follows: the evaluation of the village government in implementing monitoring and conservation activities is still weak. The EYG Group needs support from various parties. The problems faced by the group during the implementation of activities are the lack of socialization of the Village Government and the EYG Group to the community regarding the regulations of the Head of Ampiang Parak Village on the importance of turtle protection. Then, the facilities and infrastructure are minimal, and the human resources are still low. It was recorded in 2016 that the amount of aid received was IDR 95,278,000, then in 2017, the amount of aid was recorded at IDR 447,000,000, and in 2018, the amount of aid was recorded at IDR 162,900,000. The funding is outside of building lighting, then in terms of maintenance, the need for turtle feed/turtle food, operational costs such as patrol costs are often neglected, lack of transportation equipment to transport turtles to conservation sites or turtle ambulances, lack of human resources (HR), community participation in environmental rescue activities on Ampiang Parak beach is still lacking, Lack of supporting facilities and infrastructure available.

Based on information from the EYG Group, the turtle population in 2016-2019 was first recorded in 2016. The number of turtle eggs hatched in that year was 3,479; in 2017, 2,783 hatched and 120 eggs were lost; then, in 2019, the number of turtle eggs hatched was 3,408. The impact of turtle extinction is that if turtles become extinct, coastal and marine ecosystems will face damage. Since the ocean is essential to supplying food sources, damage is inevitable in both ecosystems and will impact humans. If the turtle population decreases, the frequency of turtles laying eggs on the beach will be reduced, and the nutrition received will be diminished. If turtles become extinct, vegetation around the beach will lose its first food source. This causes disturbed vegetation growth and root systems that are not strong enough to maintain sand on the beach, allowing the beach to be further eroded. Large-scale jellyfish explosions occur, including stinging jellyfish, and this condition will cause losses to the fisheries sector, tourism, and other marine activities throughout the ocean.

Based on the description of the problem that has been explained in the background above, the gaps found based on the initial information in this research can be identified as follows: First, there is still weak implementation of policies from the Nagari Ampiang Parak government in protecting turtles (Guardian Regulation of Nagari Ampiang Parak No. 4 of 2019 concerning Protection of Turtles and Their Habitats in Nagari Ampiang Parak). Second, there are still people who hunt and take turtle eggs for consumption or sale and still do not understand the contents of the policies and prohibitions based on the Nagari Ampiang Parak regulation concerning the protection of turtles and their habitats. Third, there is still a lack of human resources (HR) to manage conservation areas in Nagari Ampiang Parak. Fourth, implementing the Nagari Ampiang Parak government policy in protecting turtles is still weak.

Therefore, based on these various problems, the researcher wanted to write this article with an Evaluation of the Nagari Ampiang Parak Government in Implementing Turtle Protection. The novelty of this research is that there has not been much research on turtle conservation based on local wisdom as part of sustainable development.

Literature Review

Policy Evaluation Concept

Dunn (2017) proposed an array of criteria for policy recommendations that align with the criteria for policy evaluation. The criteria for policy recommendations encompass the following components: First, effectiveness pertains to the extent to which an alternative accomplishes the anticipated outcomes (effects) or fulfills the objectives intended by the action. The second is efficiency, which relates to the quantum of effort necessitated to generate a specific degree of effectiveness. Third, adequacy concerns the extent to which a certain level of effectiveness meets needs, values, or opportunities that may lead to problems. Fourth, alignment is intimately associated with legal and social rationality and pertains to the equitable distribution of outcomes and efforts among various societal groups. Fifth, responsiveness focuses on the degree to which a policy addresses specific societal groups' needs, preferences, or values. Moreover, sixth,

accuracy explained that the criterion of appropriateness is closely linked to substantive rationality, as the question of policy appropriateness does not revolve around individual criteria but involves the interplay of two or more criteria collectively.

Relevant Research

Maulana & Yulianti (2022) explain that the actor mapping indicated that specific stakeholders possessed varying degrees of power, influence, and interest, categorized as strong, intermediate, and weak. The research results prove that the role of stakeholders in managing the turtle conservation area is very influential, so their role is significant for the sustainability of the conservation area and will significantly influence the success of managing the Pangumbahan Beach turtle conservation area (Ismane et al., 2018). Laksmidewi's (2022) research explains that the legal framework includes international agreements and Indonesian regulations to protect turtles as endangered species, emphasizing conservation, ecotourism, and public awareness against consuming turtles. Hochscheid et al. (2022) explain that marine turtle protection policies are developed under the European Marine Strategy Framework Directive, focusing on indicators, assessments, and international collaboration to conserve vulnerable marine turtle species effectively.

Mey Susanti & Madhuri (2020) explain that solopreneurship activities in Mapak Indah Beach aim to access policy windows for turtle conservation through coordination, capacity building, and community education, enhancing protection efforts. Brei et al. (2020) explain that sea turtle protection policies, like beachfront lighting regulations, significantly increase nesting activity, aiding in species preservation and potentially reducing time to extinction, as shown in Florida. Fagundes et al. (2021) explain that the Brazilian Action Plan for Amazon Turtle Conservation aims to protect nesting sites of Podocnemis species, indicating a focused policy for turtle protection in the Amazon region.

Methodology

This type of research is qualitative research that uses descriptive methods. In this research, ten distinct categories of informants were identified by applying the purposive sampling methodology, which entails establishing specific criteria deemed capable of yielding optimal data. The research will be known based on interviews with several informants who have relevant knowledge regarding evaluating Nagari Ampiang Parak government policies in protecting turtles. This research also carried out observations in the field. In the research, the informants were as follows (See Table 1):

Table 1 Research informants

No.	Informants
1	Chairman of the Nagari Ampiang Parak
2	Secretary of Nagari Ampiang Parak
3	Nagari Community Empowerment Expert
4	Environmental Activist
5	Regional Maritime and Fisheries Service of West Sumatra Province
6	Marine Conservation Center of West Sumatra Province
7	Coastal and Marine Resources Management Center
8	Deliberative Body of Nagari Ampiang Parak
9	Environmental Expert
10	Fisheries Service of South Pesisir Regency

Data collection techniques are the most essential step in research because research aims to obtain data. In this research, the researcher collected data through interviews, observation, and documentation studies (Sugiyono, 2017). To validate the data, triangulation was carried out. The data analysis technique used in this research follows, and there are three components of data analysis: data reduction, data presentation, and conclusion (Moleong, 2014).

Results and Discussion

Pesisir Selatan Regency is located in the West Coast Region of West Sumatra Province with a beach length reaching 267 Km; as many as 47 islands are scattered in the waters of this Regency, and turtles are often found nesting and laying eggs on almost all of these islands and several other parts of the coastal area. EYG started with the anxiety of the locals who saw the beach where they interacted daily. It began to be affected by sea erosion and looked barren because of the lack of plants on the coast. The formation of the EYG started with the planting of sea cypress trees and mangroves carried out by dozens of people on Nagari Ampiang Parak Beach; after the sea cypress trees and mangroves grew and developed around the conservation area, marine biotas such as fish, shrimp, and crabs began to arrive including the increasing number of turtles wanting to lay their eggs along Ampiang Parak Beach.

EYG activities are carried out through self-help or in collaboration with the government and other non-governmental organizations. One form of exercise that turtle conservation partners have carried out is monitoring the nesting turtle beach in Nagari Ampiang Parak; if the public gets turtle eggs, the EYG will relocate the eggs to the hatchery to make monitoring more accessible. Other activities that EYG has carried out include conservation of environmental empowerment through planting coastal vegetation, such as mangroves and sea pine, for reforestation and abrasion protection of endangered species, especially sea turtles. In addition, this group also empowers coastal communities through empowering conservation partner areas in Pesisir Selatan Regency.

Starting in 2014, the handover of conservation activities from the district government to the provinces related to that authority in 2016 so that conservation authority belongs to the government starting that year; there are conservation areas managed by the government and conservation areas which are in the district controlled by the community. Conservation activities organized by the community, especially those in Nagari Ampiang Parak, are called conservation partners. Thus, to see more clearly the evaluation of a program's policy, the authors use indicators according to the findings in the field. From the research results, it can be divided into several parts, namely:

Evaluation of Policy Programs

The provincial government is needed to protect turtles. The Nagari government provides strict sanctions, and it is necessary to get special legal protection from the provincial government, regional governments, the Nagari Government, and non-governmental organizations that are members of the marine and fishery resource supervisory community group. This is because the current turtle population continues to decline. In this case, the extinction of turtles is increasingly being lifted to the surface; the decline in the number of turtles is also believed to impact the Environment.

With the policy that regulates the prohibition of hunting turtles and their eggs following applicable policies and regulations, it is hoped that it will minimize the impact of turtle extinction as a form of turtle protection and conservation. Based on the Policy of the Nagari Ampiang Parak government Number 4 of 2019, it is necessary to re-evaluate the policy and conduct socialization to the Conservation Partner subgroup so that the contents of the policy objectives and implementation can be achieved. The conservation authority that belongs to the government starts that year; the government manages conservation areas, and the community controls conservation areas. Conservation activities are managed by the community, especially in Nagari Ampiang Parak. The community entirely does the management, and the government only assists the community and guides groups.

Achievement of Policy Program Objectives

Achieving the objective of evaluating the policies of the Nagari Ampiang Parak government in protecting turtles is the goal of ensuring the extent of harmony between the final results of implementing a program. The aim is to see to what extent the legalized policy has been maximally implemented in the protection of turtles, and based on interviews with the Chairman of Nagari Ampiang Parak who explained that the goal is none other than empowering turtles, wanting to develop how turtles can be licensed. Their habitat is protected, especially when implementing policies that have been legalized.

Sufficient Resources

Policy achievement requires sufficient supporting resources, such as human resources, funds, facilities, and infrastructure. Turtle protection has been explicitly provided. The management funds at the Nagari Ampiang Parak Turtle Conservation Partner use the budget for donations from the Central Government, Regional Government, and Nagari Government; the operational costs include turtle care, turtle feed, turtle posts, and buildings at the Turtle Conservation Partner. Meanwhile, the operational costs for the transportation of members are still not entirely fulfilled, and the government pays attention to this, especially in this funding; based on research findings, they explained that primarily, it is to invite and appeal based on socialization depending on the community resources. The stages cannot be completed simultaneously; every program they make and implement cannot be completed simultaneously.

Environmental Conditions

Based on field observations and interviews conducted with the Ampiang Parak turtle conservation group, the conservation carried out is as follows: First, eggs from turtle nesting sites, whose distribution spread along the coast of Nagari Ampiang Parak, are moved to an incubator that gives more protection from predatory animals.

Second, a container tank is used to care for newly hatched hatchlings so they are more ready to be released into the sea. Third, provide the availability of knowledge facilities and several learning media for students and the community to increase their knowledge of life, the importance of maintaining the turtle population, the characteristics of turtles, and the characteristics of the turtle habitat. The benefits of this activity are that it provides knowledge and insight to minimize the impact of turtle extinction. Fourth, the residents of the conservation area are given briefings on how to be directly involved in developing the turtle tourism area in Nagari Ampiang Parak.

According to (Lohmann et al., 2008), hatchlings (turtle chicks) that have just hatched are not immediately released into the sea but are kept in a holding tank or hatchling tank so that the hatchlings are better ready to be cast into the open sea; the hatchlings and turtles which are then released are lightweight. Hatchlings kept in holding tanks before being released to the sea can be checked to isolate disabled and diseased hatchlings so that the success of turtle hatchlings at sea can be optimized. Community activities around the turtle hatchery such as fishing boats that are continuously operating, are still carried out.

The Lack of Facilities and Infrastructure to Support Turtle Protection at Ampiang Parak Turtle Conservation Partners.

Based on the research findings, it is seen that protecting animals or living things requires significant funds and costs, starting from, for example, operational costs for electricity and fuel, including the costs of personnel who carry out all kinds of patrol activities, when compared between group incomes. Daily operational needs are increasing, including charges for turtle feed and mangrove maintenance, which are still minimal. Furthermore, facilities and infrastructure are the most significant obstacles, especially in managing turtles and their protection at turtle conservation partners.

There are still many obstacles, especially regarding financial assistance, facilities, and infrastructure of the central, regional, and Nagari governments. Many of these do not pay attention to the need for conservation management. Based on the interview above and observations in the field, the obstacles in protecting and managing turtle conservation partners can be seen. The government still lacks special attention in providing supporting facilities and infrastructure.

Lack of Socialization and Supervision by the Nagari Government

In addition to the low quality of turtle conservation, another factor contributing to the low conservation and management of turtle protection is the Nagari government's lack of supervision and socialization with the Nagari Ampiang Parak turtle conservation partners. Socialization and control that is still minimal can be seen starting from the supervision that is not routinely carried out and training and socialization to the community, which is still very limited. Based on the research findings in terms of supervision and socialization, there were also many obstacles, one of which was a miscommunication between the Nagari government and the EYG.

The problem is related to budget constraints because indirect outreach to the community requires a place, location, and several delegates from the district government. Based on the interview data, we can see that the steps taken by the Nagari Ampiang Parak government in providing information regarding the policy rules are still not optimal. It can also be seen that the participation of the Nagari community in protecting the turtles is still not optimal, and it cannot be said that the protection of the turtles has not been maximized. This follows the research findings, which explain that there is still a lack of awareness to accept the policy by the Nagari community in protecting turtles; this is because not all Nagari people understand and know how to protect turtles properly and correctly. Then, not all people follow and see the socialization from the Regency or Nagari Government to protect these turtles. The role of the Nagari Ampiang Parak Government in protecting turtles is based on the theory of policy evaluation (Dunn, 2017), which can be seen in the following discussion:

Effectiveness

Effectiveness comes from the word practical, which means achieving success in achieving the goals that have been set (Ramdani et al., 2024; Balode & Blumberga, 2023). Facts found in the field, such as Nagari policies and regulations concerning the policy for protecting coastal ecosystems, especially turtles in Nagari Ampiang Parak, are still ineffective. Several programs from the Nagari government have not fully succeeded in achieving the goals and objectives of the Nagari government in protecting turtles in Nagari Ampiang Parak. The policy states that turtles are marine reptiles protected by the government, and turtle protection is a shared responsibility between the government and the community. However,

in reality, this regulation has not been widely implemented, and many people still do not fully understand the contents of the Nagari Ampiang Parak government policy in protecting turtles because the government has not paid enough attention to intensively socializing the contents of the protection policies that have been made.

Gedeian (1991) defines effectiveness as the more significant the extent to which an organization's goals are met or surpassed, the greater its effectiveness. However, until now, the government of Nagari Ampiang Parak and Turtle Conservation Partners have not or still very rarely provide motivation or encouragement so that turtle conservation is maintained and the policies made can run well.

Efficiency

The efficiency referred to in this study is to evaluate the policies of the Nagari government regarding the use of optimal resources so that goals will be achieved. Thus, it is hoped that the Nagari Ampiang Parak government and Turtle Conservation Partners in Nagari Ampiang Parak can use resources to achieve the goals of existing policies. Based on the research results obtained in the evaluation of the Nagari Ampiang Parak government in protecting turtles based on the regulations of the Wali Nagari Ampiang Parak, socialization has been held for the community and training to provide knowledge in terms of how to protect and manage turtles properly and correctly.

However, in this case, many people still do not understand the Nagari government's program. Then, the training education and socialization held by the Nagari government, which also collaborates with the district government, does not close the possibility for stakeholders, especially the community in Nagari, to know the management and empowerment of existing resources. However, in this case, the government still lacks supervision of turtle protection, and many stakeholders are ignorant even though policy socialization has been implemented. Related stakeholders have not utilized socialization efficiently. Moreover, the principle of efficiency in turtle protection policies has not been achieved optimally.

Adequacy

The concept of adequacy in public policy can be articulated as the extent to which the objectives attained are perceived to be satisfactory in multiple dimensions (Andrews, 2022; Guerrero et al., 2024). Thus, it can be inferred that adequacy remains interconnected with effectiveness by evaluating or forecasting the extent to which the available alternatives can fulfill needs, values, or opportunities in addressing various forms of impending challenges (Boix-Cots et al., 2024; Jarzabkowski et al., 2024).

Based on the regulatory policy in the protection of turtles in terms of results, the conservation area is still inadequate in terms of financing and post-guard building infrastructure, turtle feed costs, and operational costs, which is one of the essential roles for turtle protection. With the lack of supporting conservation infrastructure in Nagari Ampiang Parak, the fulfillment of the need to protect turtles in the place of the turtle conservation partners is hampered.

Despite the community's awareness regarding the significance of turtle conservation, a considerable portion of the Nagari Ampiang Parak populace is still unfamiliar with the appropriate methodologies for adequate turtle protection. Empirical data collected in the field indicate an imperative need for a thorough re-evaluation and extensive socialization initiatives orchestrated by the Nagari government, directed towards the local community, to facilitate the implementation of the established policies.

Alignment

Alignment in policy can have the same meaning as justice given and obtained by public policy targets (Peay, 2024; Inderberg & Bailey, 2022). Dunn (2017) stated that equity criteria are closely related to legal and social rationality and refer to the distribution of consequences and efforts between different social groups. According to field data on the turtle protection policy in Nagari Ampiang, the Nagari government and community groups have felt the benefits of the turtle protection program.

Responsiveness

The term "responsiveness" within the realm of public policy refers to the reaction of the target demographic to the execution of a particular policy initiative (Butler & Vis, 2022; Liu et al., 2025; Rosset, 2022). As Dunn (2017) articulated, responsiveness pertains to the extent to which a policy can fulfill the requirements, inclinations, or principles of specific community factions. The efficacy of a policy can be assessed through the community's reaction to its execution after an anticipatory analysis of the potential outcomes that may arise from the policy's implementation (Ahmad et al., 2024; Ogu & Nebo., 2025).

Based on the research findings, the EYG for the environment feels that they are still not satisfied with the evaluation policy of Nagari Ampiang Parak regulations

in conducting guidance and outreach to the community. Such will make it easier for the community to get advice and direction from the central, regional, and Nagari governments. From this data, it can be seen that the policy to protect turtles still does not change the community's economy.

Accuracy

Policy accuracy is the value, quality, and quality of the policy goals based on the hypothesis underlying these goals (Botterill, 2024; Linquiti, 2024; Luján, 2023). The maximum accuracy of the Nagari government policies based on the ratified regulations has not been maximized because many of these regulations have not been appropriately implemented.

Appropriateness refers to the policy objectives' value or price and the underlying assumptions' strength (Veselý, 2024). Dunn (2017) states that appropriateness is a criterion used to make recommendations by assessing whether the results of the recommended alternatives are a feasible choice of objectives. The feasibility criteria are related to substantive rationality because this criterion concerns the substance of the objectives, not the means or instruments to realize those objectives.

The policy aims to foster public concern and awareness about participating in turtle protection. This means that the regulation is still far from expectations; not all Nagari communities understand the importance of maintaining marine ecosystems, especially in turtle protection, due to the lack of information training and socialization from the Nagari government to the community. Based on the discussion above, the appropriateness of the turtle protection policy has not been optimally successful.

Among the six indicators utilized in public policy evaluation, it can be articulated that five indicators—precisely, effectiveness, efficiency, accuracy, adequacy, and responsiveness—have not reached their optimal levels of achievement. In contrast, the leveling indicator has demonstrated a measurable positive impact on society, although it remains subject to further enhancement.

Conclusion and Recommendation

Based on the findings and discussion of the research that has been done, it can be concluded that, among other things, the evaluation and implementation of Nagari government policies in protecting turtles have been implemented but have not been maximized. One indicator has been proficiently attained among the six indicators assessed, specifically policy alignment. Conversely, suboptimal delivery and dissemination have not optimally realized the effectiveness, efficiency, adequacy, accuracy, and responsiveness indicators.

Two factors caused the obstacles encountered in protecting turtles in Nagari Ampiang Parak. Constraints caused by internal factors are (a) lack of implementation of the policy implementation of the Nagari Ampiang Parak Government in turtle protection, (b) lack of socialization and supervision of the Nagari government towards turtle conservation partners; external obstacles are (a) Lack of supporting facilities and infrastructure turtle conservation area. (b) The level of people's education is still low.

Based on the results of observations and research that have been carried out, suggestions that can be given for turtle protection are as follows: First, improve the quality of policies; the Nagari government must pay more attention to the routine training and outreach provided to Nagari officials, turtle conservation partner groups, and the entire Nagari community, a maximum of once a month, as well as policies related to turtles. Second, to increase people's awareness, the Nagari government must conduct more intensive outreach and training on turtle protection. Third, the performance of the Nagari Government program regarding turtle protection must be maximized so that it can be implemented optimally.

This research is theoretically expected to become material for study to enrich the use of policy evaluation concepts, especially in environmental protection and ecology. Meanwhile, practically, this research is expected to become a consideration for stakeholders, both government and society, in improving performance in implementing turtle protection policies and as a basis for enhancing relevant policies. It is hoped that future research will focus on innovative and collaborative policy design between stakeholders in ecological protection by involving all stakeholders.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Policy issues in promoting the adoption of artificial intelligence in Thai public hospitals

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Abstract

This study investigates policy issues concerning the leveraging of AI potential to benefit healthcare services in public hospitals in Thailand. The study employs qualitative research methods and draws insights from in-depth interviews with 36 key informants involved in policy support, development, or implementation of healthcare-related AI innovations. The analysis of policy issues is facilitated using the technological innovation system (TIS) framework. The study identifies several issues including: inadequate mechanisms for effective innovation dissemination, market entry barriers, unclear legitimation processes for medical AI, resource inefficiencies, and ineffective translation of policy frameworks into practice in innovation activities. It shows how activities within the TIS influence the adoption of AI in public hospitals, by impacting innovation suppliers, users, and the mechanisms connecting the suppliers to broader user bases. The study has generated insights that benefit policymakers and relevant parties in designing better support for promoting the development and adoption of AI innovations in public health.

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Introduction

The social and public health situation in Thailand necessitates improving healthcare service efficiency. With an aging population, healthcare expenditures are projected to triple from 539–633 billion baht in 2017 to 1,407–1,854 billion baht in 2032 (Thailand Development Research Institute, 2018). Thailand also faces a lower doctor–population ratio of 0.92:1000 compared to the World Health Organization benchmark of 1:1000 (Siripanumas et al., 2022), with physicians unequally distributed, particularly in rural areas due to heavy workloads. This leads to physician resignations from state hospitals, exacerbating the uneven distribution of the health workforce (Siripanumas et al., 2022). The scarcity of specialized medical professionals, such as radiologists, affects healthcare quality, especially in the timely interpretation of chest X-rays (Singweratham et al., 2021; Tangjai, 2020). Another example is the shortage of ophthalmologists, which results in delays in the diagnosis of diabetic retinopathy and age-related macular degeneration. This potentially leads to patients not receiving timely treatment and consequently experiencing vision loss (Tantibundhit et al., 2020).

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Artificial intelligence (AI) has been recognized in national policy documents as a crucial technology to help elevate the provision of medical services in Thailand. The 13th National Economic and Social Development Plan recognizes the development and utilization of AI as part of the strategy to leverage digital technology and information systems, to support medical services, improve efficiency, reduce workload, and address the shortage of medical personnel (Office of the National Economic and Social Development Council, 2023). In 2022, Cabinet of the Thai Government adopted a National AI strategy and Action Plan (2022–2027), the first national-level plan to outline comprehensive AI policies. The plan specifies the importance of AI applications in healthcare that Thailand should prioritize, notably AI for medical image diagnosis and telemedicine (Ministry of Higher Education, Science, Research and Innovation & Ministry of Digital Economy and Society, 2022). Recently, various types of AI have been applied in the area of public health in Thailand. For instance, since 2018, Google has partnered with the Department of Medical Services (DMS), under the Ministry of Public Health (MoPH) to develop AI to assist in diagnosing diabetic retinopathy. Since 2019, various chest X-ray interpretation AI technologies (such as AIChest4All, RAMA-AI, and Inspectra-CXR) have been developed by different organizations to aid in screening chest-related diseases such as tuberculosis, cancer, and COVID-19 pneumonia. Chulalongkorn University has developed the AI "DeepGI" for detecting abnormal polyps in the colon, and it has been tested on patients since 2021. In the area of treatment pathways and support, Chulabhorn Hospital has piloted the use of the AI "Watson for Oncology" for oncology treatment planning since 2020.

Literature indicates that several policy issues could affect the adoption of AI in public healthcare. Regarding government regulation, AI adoption may be impeded if a robust regulatory framework ensuring privacy, security, quality, and accuracy is lacking (Haider, 2020). Conversely, excessive regulation may lead to high financial commitments and organizational inertia due to stringent limitations on AI applications (Hamm & Klesel, 2021). The availability of various resources within the ecosystem also impacts the adoption. For example, countries may encounter challenges with the availability of quality datasets, hindering AI model development and implementation in the health sector (Gujral et al., 2019; Haider, 2020). A lack of financial resources can also be a barrier, as seen in studies on AI adoption by the National Health Service in the United Kingdom (Morrison, 2021). Governments play a crucial role in shaping AI adoption strategies for various reasons, such as reducing health inequalities between social classes, saving healthcare costs by improving early diagnosis and promoting better prevention through self-health management (Ossewaarde & Gulenc, 2020).

To fully leverage the potential of AI in the healthcare sector, it is necessary to understand the policy issues associated with promoting widespread adoption. To analyze the policy challenges in the ecosystem of medical AI, the study will use a framework of the technological innovation system (TIS) as a guideline for analysis. This framework has advantages in explaining the emergence, growth, and dissemination of technology within a community (Bergek et al., 2008; Hekkert et al., 2007). Such advantages are owing to the system functions, one component of the TIS framework, which illustrate the dynamic innovation supporting activities within the system. Such features are not seen in other innovation ecosystem frameworks such as the national innovation system or sectoral system of innovation (Köhler et al., 2016). System functions refer to contributions made by structural components, static parts of a TIS, to achieve goals of development, diffusion, and utilization of technological innovation in the system (Sawulski et al., 2019). The analysis of TIS functions can help researchers identify the drivers and barriers within a system as well as holistically evaluate the ecosystem performance in promoting a particular technological innovation (Edsand, 2019; Sawulski et al., 2019). The results can ultimately benefit policy formulation in this area. Different TIS functions are shown in Table 1.

Table 1 TIS functions and descriptions (Bergek, 2019; Bergek et al., 2008; Hekkert et al., 2007) summarized by the authors

TIS Functions	Descriptions
1. Knowledge development and absorption	The knowledge base of TIS, its breadth and depth, and its evolution over time, covering technology and innovation management knowledge, scientific knowledge, and technology capability.
2. Knowledge diffusion	Exchange or transfer of information, knowledge, and technology among different entities in networks
3. Formation of market	Opening up of a space or arena for the exchange of goods and services among suppliers and buyers in a semi-structured manner.
4. Legitimation of innovations	Process of achieving legitimacy of the new technology among relevant stakeholders.
5. Mobilization of resources	Process for acquiring different types of resources required for innovation to occur.
6. Entrepreneurial experimentation	Process for reducing uncertainty about the prospect of new technologies through trial-and-error experimentation with new technologies, applications, and strategies.
7. Guidance and direction of the search	The process leading to the formation of priorities for the technology that actors should adopt.

The objective of this study is to investigate policy issues in leveraging the potential of AI in public hospitals in Thailand. The main research question is "what are policy issues for promoting the adoption of AI innovations in public hospitals in Thailand?" The primary author adapted the TIS functions to align with the issues related to the adoption of AI innovation. First, the author introduced the function "dissemination of innovations". Although other functions can analyze activities that indirectly impact innovation diffusion, they do not concern the mechanisms driving AI innovations from suppliers to widespread use. Second, the function "knowledge development and absorption" was removed since issues related to this function are already embedded in other functions, particularly the mobilization of resources as well as entrepreneurial experimentation. Moreover, the function "knowledge diffusion" was also dropped and incorporated into the proposed "dissemination of innovations" function, as it concerns the exchange or transfer of information about existing innovations among different entities in networks. This study proposed the modified TIS functions as follows: (1) dissemination of innovations, (2) formation of market, (3) legitimation of innovations, (4) mobilization of resources, (5) entrepreneurial experimentation, and (6) guidance and direction of the search.

Methodology

This study employed a qualitative research method. This approach is appropriate for investigating research questions that are exploratory and for identifying variables that are difficult to measure within a group or population. Additionally, a qualitative research method offers advantages in understanding complex and detailed issues. Moreover, a qualitative research aids the author in understanding the contexts or environments in which the study participants engage with a problem or issue (Creswell, 2013).

Participants

This study utilizes data from a database of in-depth interviews, which is part of the doctoral dissertation titled "The Adoption of Artificial Intelligence Innovations in Thai Public Hospitals: Multiple Case Studies." The database contains records of interviews with 52 key informants, 36 of whom reported policy issues at an ecosystem level. The key informants, shown in Table 2, include representatives from government agencies, higher education institutions, public hospitals, and a medical-AI service provider involved in policy support, development, or implementation of healthcare-related AI innovations. In this database, public hospitals are those that have adopted AI-based image processing technology for lesion screening of patients. Compared with other types of AI, image-processing AI, especially chest X-ray image analysis AI, is among the most widely adopted by the healthcare sector in Thailand.

Table 2 A summary of key informants and code names

Affiliations	Positions of key informants	Number	Code names
Government agencies			GA 1–10
Office of National Higher Education Science Research and Innovation Policy Council	Middle management leaders	2	
Department of Medical Services	Senior management leader	1	
Food and Drug Administration	Officers	2	
Digital Economy Promotion Agency	Senior management leader	1	
National Electronics and Computer Technology Center (NECTEC)	Director	1	
Program Management Unit for Human Resources & Institutional Development, Research and Innovation (PMU-B)	Senior management leader	1	
	Officer	1	
Program Management Unit for Competitiveness (PMU-C)	Expert	1	
Higher education institutions	Engineering/data science professors	6	HE 1–6
University-partnered/ affiliated hospitals	Head, of department/ former head of center of excellence	2	UH 1–6
	Gastroenterologists	2	
	Radiologists	2	

Table 2 Continued

Affiliations	Positions of key informants	Number	Code names
Ministry of Public Health (MoPH)-affiliated hospitals			MPH 1–11
A specialized cancer hospital	Hospital directors	2	
	A senior management leader	1	
A standard-level hospital	A senior management leader	1	
	An IT officer	1	
An advance-level hospital	A senior management leader	1	
	A nephrologist	1	
	A radiologist	1	
Community-level hospitals	Hospital directors	2	
	An IT officer	1	
An AI service provider	A chief executive officer	1	ASP 1–3
	A chief operating officer	1	
	A co-founder	1	
Total		36	

Data Collection

The data collection for this database was conducted by the primary author using semi-structured questions from February to July 2023. The primary author employed purposive sampling (Tashakkori et al., 2020) to identify relevant key informants and snowball sampling (Tashakkori et al., 2020) to collect data from additional informants based on recommendations from previous informants. Open questions were asked to interviewees about the process of AI adoption (where relevant) as well as the drivers and barriers to adoption. Each interview lasted 30–120 minutes, depending on the interviewees' roles in the healthcare-AI ecosystem. Interviews were audio or video recorded with the interviewees' permission and then transcribed orthographically into written words.

Data Analysis

The primary author conducted thematic analysis on the transcribed materials. Thematic analysis is used by scholars to systematically identify, organize, and provide insight into patterns of meaning across a collected dataset. It can be applied to studies with a large number of interviewees (Braun & Clarke, 2012; Clarke et al., 2015). The primary author then sought a theme related to policy issues at an ecosystem level concerning the promotion of AI innovation adoption. The analysis was assisted by ATLAS.ti 23 software. The result of the analysis is a synthesis of insights provided by the software and the author's judgment.

Ethics

Ethical approval for this study was obtained from the Ethics Committee in Human Research, National Institute of Development Administration [Reference Number: COA No. 2023/0004].

Results and Discussion

The data analysis reveals that the ecosystem of AI-based medical innovation in Thailand faces various policy issues as follows.

Dissemination of Innovations

The process of disseminating medical-based AI innovations in Thailand faces several challenges. First, there is the issue of benefit sharing arising from joint research and development projects in AI (*GA3, GA7, MPH2*). This arises due to the involvement of multiple entities, requiring multidisciplinary collaborations among different organizations.

> *"Once the (AI) innovation generates income, it would cause an issue. If benefit sharing is not fair, it would cause limitation to widespread implementation. . . . We need to negotiate on benefit sharing. Otherwise, the public health system would not benefit from the innovation and the cost of implementing would remain high."*
>
> (MPH2, personal communication, March 31, 2023)

This becomes particularly crucial if hospital data are utilized for developing commercial AI technology (*GA1, GA10*). Research universities often have clear

mechanisms to manage innovations resulting from multidisciplinary collaborations, such as technology accelerators and incubators.

Secondly, there is a lack of sustainable business models, particularly for AI systems developed from university research projects (*HE6*). Such issues arise partly because the development of some medical AI technologies is driven by university researchers rather than market demand (*GA8*, *UH4)*. A business model could be a system integrator which plays a crucial role in scaling up and disseminating AI prototypes developed by researchers for subsequent widespread adoption (*GA10*). This process requires a substantial budget and effort to maintain the system's functionality at a high quality (*HE6*).

> *"Many (AI) projects have benefits and high impact for the country, but they cannot proceed because there is no funding to sustain the system. Medical AI systems require a lot of resources. For example, (the name of chest X-ray AI system) needs to be run on a GPU, which costs hundreds of thousands (baht). If we do not have any money, where will we get it from? Also the salary for someone to monitor the system 24/7, where will that come from too? This has been a problem we have been facing all along."*
>
> (HE6, personal communication, April 7, 2023)

Thirdly, a clear mechanism for scaling up AI adoption in state-owned hospitals at a reasonable cost remains elusive. Researchers and developers typically rely on their networks to disseminate developed AI applications (*UH5*), necessitating intermediary organizations to facilitate scaling-up efforts. Likewise, hospitals that adopted AI innovations indicated that their awareness about the existence of AI innovation and subsequent adoption decisions were driven by existing networks. These networks include informal relationships with other hospitals *(MPH4)* or the Thai Health Tech Association *(MPH6)*, existing relationships with IT service suppliers *(MPH9)*, or academic collaborations with an innovator hospital *(MPH10)*. The DMS is developing a sustainable model for scaling up AI innovation in public hospitals (*GA3*). Regional or Provincial Health Offices could potentially facilitate dissemination by negotiating optimal prices with developers, leveraging their responsibility for supporting health service agencies (*MPH2*). Budget support from the MoPH to these offices is crucial for widespread AI adoption in public hospitals.

Formation of Market

Market formation involves creating a space for goods and services exchange between suppliers and buyers in a semi-structured manner (Bergek, 2019). In this study, it was found that government procurement serves as a tool to stimulate the AI technology market. The Thailand Innovation List, introduced in 2015, incentivizes state agencies to procure goods or services from listed vendors through special procedures, aiming to promote innovative products and services by Thai entrepreneurs (The Secretariat of the Cabinet, 2015). While a medical AI product has been added to the Innovation List (*ASP3*), options remain limited. Medical AI devices must be registered with the Thai Food and Drug Administration (FDA) for inclusion to the List, but FDA registration is seen as costly and cumbersome (*GA7, MPH1, MPH5*). Slow FDA certification is attributed to a shortage of technical experts in AI medical software (*GA3, GA4, GA5*). Businesses may expedite certification by registering products in major markets before seeking Thai FDA approval (*GA5, GA10, ASP1*). Financial constraints hinder compliance with FDA standards for non-commercial AI devices developed by researchers in universities or public hospitals (*MPH1, MPH5*). Additionally, hospital users may not recognize the need for FDA certification for AI software (*MPH4, MPH7, MPH9*).

> *"Regarding the FDA registration, I really view the AI as a disease screening gadget so I did not consider that it had to be registered with FDA. Moreover, it is neither a medicine nor medical product. It is also too new to have a qualification (for registration). Additionally, if it does not affect the workflow of patient treatment, doctors may not have concern (of using it)."*
>
> (MPH7, personal communication, May 9, 2023)

Despite lacking FDA approval, some hospitals adopted AI technology (such as like AI chest X-ray technology), because of its benefits. Clarity on whether AI medical applications need FDA certification was deemed "ambiguous" (*MPH5, ASP1*). This ambiguity likely results from inadequate information dissemination by the FDA to the public (*GA4*).

Legitimation of Innovations

Legitimation in the context of TIS is the process of achieving legitimacy of the new technology among relevant stakeholders. This includes adaptation or

conformity to existing institutions, alteration of existing institutions or the creation of entirely new institutions (Bergek, 2019). Acceptance of new technology by relevant actors is crucial for gaining political support (Bergek et al., 2008). The study found varying opinions on AI displacing healthcare professionals. Fears of displacement could be a barrier for initiating R&D projects in medical AI, especially when forming a research team (*MPH5*).

> *"In terms of acceptance, back then, radiologists were against it. I invited many people to join (the AI research project). . . . They were afraid of losing their career. If this (AI chest X-ray) software comes in, will it take their jobs? Will it reduce their value?"*
>
> (MPH5, personal communication, April 19, 2023)

However, there has been growing debate among healthcare professionals about the AI benefits. For instance, the Radiological Society of Thailand organized the First Thailand Conference on AI in Medical Imaging in 2021. The Royal College of Radiologists of Thailand released guidelines for leveraging the benefits of AI in radiological practices during 2021–2023. These include procurement and utilization guidelines and a standard operating procedures for AI testing in tuberculosis screening.

The study highlights the ongoing process of regulative legitimation (Bergek, 2019) of AI-related cross-sectoral issues within existing legal frameworks. Currently in Thailand, there is no specific law governing activities related to research, design, development, utilization, and transfer of AI-related technologies. These activities are still subject to overarching legal frameworks that govern the security of personal data such as the Personal Data Protection Act (PDPA) B.E. 2562 (discussed later) and the Cybersecurity Act B.E. 2562. Ethical oversight for research related to AI is managed by the ethics committee in human research, under the National Ethics Committee Accreditation System of Thailand (NECAST) (National Research Council of Thailand [NRCT], 2018). This system oversees all disciplines of research that involve human subjects. This committee operates at various levels, including the ministry level, the department level, the provincial level, the hospital level, and the faculty level within universities. Given that the unstandardized practice of personal health data management for research purposes remains, the ethics committees within the respective organization must independently determine the appropriate usage of such data for research. Hospitals within medical schools often justify data usage for AI research to improve the hospital services quality. However, it remains unclear whether such actions are permissible *(GA7)*. Inappropriate practices in human research ethics certification at the ministry level, including overstepping authority, unreasonable document requests, and miscommunication between committees and research teams, were reported (*MPH1, MPH5*).

Mobilization of Resources

Data

Recently, various government agencies have invested in digital infrastructure to support AI research and development. In 2019, the National Science and Technology Development Agency (NSTDA) launched the NSTDA Supercomputer Center or ThaiSC, featuring ASEAN's most powerful supercomputer, "LANTA," to support cost-effective AI research. The Ministry of Digital Economy and Society (D.E.) also introduced the G-Cloud to enhance data sharing and AI development across government agencies. To further strengthen health data infrastructure, the DMS plans to invest in a cloud server for deploying AI algorithms in nationwide medical services. This will support major AI and big data projects, like Genomics Thailand, and serve as a repository for Thai-owned data *(GA3)*.

The health data ecosystem in Thailand faces ongoing challenges in managing personal health data, including generation, sharing, and utilization. The Personal Data Protection Act (PDPA) represents Thailand's primary legislation on personal data protection, providing guidelines for collecting, using, and disclosing such data. While the PDPA lacks specific provisions for data utilized by AI systems, it serves as a framework for managing data crucial for AI training. However, enforcement of the PDPA poses challenges for AI development. Firstly, hospitals, as data owners, express concerns about data security, leading to hesitancy in releasing personal health data to researchers (*GA1, GA8*). This reluctance complicates data-sharing among hospitals and different research partners, hindering collaboration in medical AI research (*HE4, UH1*). Moreover, normally, the sharing of data among different entities requires protocols such as approval from the respective ethics committee in human research. While this is necessary, the process further slows down external validation in the development of AI and the overall AI development process.

"We had concern on patients' personal data sharing. It would be easier to manage patients' data from a hospital within the (same) university. . . . We attempted to discuss (collaboration) with other university, but we found difficulty in data sharing."

(UH1, personal communication, April 8, 2023)

Secondly, there is ambiguity in defining personal information, particularly regarding non-identifiable, anonymized data such as X-ray images (*GA7, ASP3*). Decisions on the appropriateness of using these types of data for R&D project are entirely subject to the ethics committee in human research within each respective organization (*ASP3*).

"When the PDPA came into effect, we had to study it. However, for lung X-ray data that we do not know to whom such belongs and having no identity, it's unclear . . . This issue is a bit ambiguous, and many organizations are discussing what to do with it. Every research project in the country nowadays refers to ethical guidelines. But the PDPA does not clearly state what is allowed or not."

(ASP3, personal communication, March 9, 2023)

Thirdly, there is a limited availability of public health data necessary for AI model development (*GA8*, *ASP3*). Some types of data are in short supply such as those from three-dimensional magnetic resonance imaging (3D-MRI) since they are not generated from conventional health check-up services (*HE4*). In contrast, open-source data from other countries may have limited quality since they may not be prepared purposively for a specific AI R&D project. Nevertheless, the preparation of data to become suitable for AI training is technically complex, time-consuming, and requires a group of high-level experts to work together (*HE6, ASP3*). In healthcare-related AI, these experts are medical professionals who are pre-occupied with existing medical service workload and may not be available for an AI development project (*UH3, UH4*).

Financial resources

Following Thailand's 2019 reform of the science, research, and innovation system, public R&D funding agencies have taken on more strategic roles in promoting innovation. There has been a clearer division of labor among R&D funding agencies, utilizing the technological readiness level (TRL) as a framework for such divisions *(GA8)*. Funding agencies have also introduced financing schemes to foster collaborative innovation and accelerate entry to the market *(GA8, GA10)*. For example, the Program Management Unit for Competitiveness (PMU-C) requires matching research funds with the private sector to ensure commercial technology transfer and, also, provides supports for medical AI prototypes in obtaining FDA certification *(UH1)*. In 2023, overall public spending in R&D and innovation projects related to AI (in all fields) was 7,355 million baht, increasing by 15 percent from 6,411 million baht in 2022 (National Science and Technology Development Agency, 2023).

Despite the novel funding system being in place, interviewees reported issues related to financial support both in the R&D process and in the implementation of AI technologies in hospitals. Regarding the R&D process, delayed, or inadequate public R&D financial support from government funding agencies was reported. Interviewees also reported a significant amount of advance payment for equipment necessary for the development project (*HE6, UH3*). Approval for research funding is naturally a lengthy process. Without the advance payment, the testing and external validation of AI applications would be impossible. Moreover, inadequate financial support in the very early, risky stage of development discourages the researchers from joining the AI R&D project. Instead, the financial support came at a less risky stage when the AI prototype had been developed successfully (*UH3*). The lack of budgetary allocation for R&D corresponds with the limited R&D investment in Thailand compared to other countries. In 2021, the country's R&D expenditure was 195,570-million-baht, equivalent to 1.2 percent of the country's GDP, compared with other developed nations, such as South Korea (4.9%), Japan (3.3%), and Singapore (2.2%). Public sector investment in R&D constitutes 26 percent of total R&D expenses (NRCT, 2023).

In terms of implementation, hospitals reported a deficiency in financial support from the MoPH (*MPH6, MPH9, MPH10*). Budget allocation or technological support does not align with the country's vision to promote digital technology adoption in public hospitals, despite policies like smart hospital initiatives and S-curve industries policies covering medical hubs and digital technology (*MPH1, MPH6, MPH9*).

"MoPH hardly supports us. The budget is scarce. Budget cuts always happen. The hospital must find a way by ourselves if we think the technology is important. The MoPH hardly offers these (technologies) to us. A software that is used nationwide does not exist."

(MPH9, personal communication, May 29, 2023)

Additionally at a bigger picture, funding for implementing the Thailand National AI Strategy and Action Plan (2022–2027) has not been automatically allocated, despite cabinet endorsement, necessitating case-by-case funding applications to various agencies (*GA7*). Limited AI adoption demand may stem from state hospitals' technological readiness issues, lacking fundamental IT infrastructure (*GA10, MPH4*).

Own hospital revenues serve as a potential financial source to support the implementation. However, small community hospitals often have insufficient income to spend on the adoption of costly AI technology, unless they receive financial support from external resources through special projects (*MPH3, MPH4, MPH10*).

> *"Other hospitals saw (the chest X-ray AI) and also wanted to subscribe, but they lacked budgeting. However, in future, if the financial support becomes halted, we are not sure if we could continue the subscription."*
>
> (MPH10, personal communication, June 13, 2023)

Human resources

Shortage of skilled manpower for the development of AI model impeded the AI development project. The shortage is significant for researchers in computer science, computer engineering, or data science and AI engineers or data engineers that have to be responsible for the deployment of digital technology in the medical field, where stringent standards for technology deployment for patient care is necessary. A shortage of skilled digital professionals with hands-on experience in the industries has created an obstacle to direct investment from international technology companies that plan to invest in cloud infrastructure in the country (*GA10*). Besides, there is a shortage of domain experts involved in the development process of AI algorithms and data labeling (*GA8*, *GA10, HE3, UH4*). In the development of medical AI applications, these domain experts are specialized physicians who are frequently occupied with patient care responsibilities (*GA10*).

> *"The problem is that we did not have manpower. Despite the funding we had. . . . that funding could have been spent on hiring someone (to label data). But we could not hire anyone. Those who would take this job must have knowledge. We need to hire doctors to do this, but they are already overwhelmed with work."*
>
> (UH4, personal communication, February 10, 2023)

The reported shortage is consistent with the findings of the Government AI Readiness Index 2023, which indicates that Thailand's human capital index scores are among the lowest compared to other areas. The shortage of personnel will have repercussions on other TIS activities, including the development of a data ecosystem (due to a lack of personnel for data labeling) and trial-and-error experimentation.

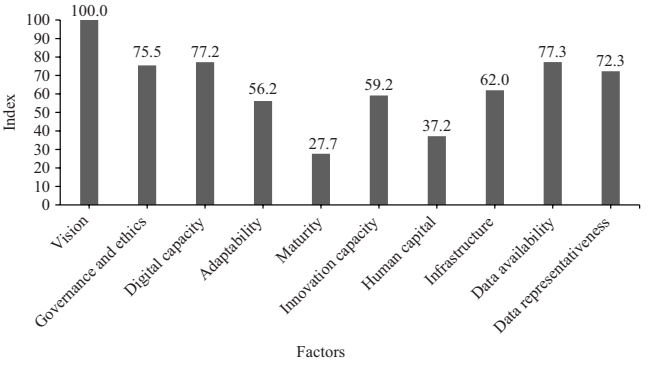

Figure 1 Thailand's Government AI Readiness Index 2023.
Source: Oxford Insights (2023). Summarized by the authors.

Entrepreneurial Experimentation

Various organizations engage in trial-and-error experimentation with new AI medical technologies, applications, and strategies to reduce uncertainty. The DMS directly mitigates the uncertainty associated with the adoption of novel medical technologies. In one way, the DMS serves as a hub to support the development of a management model and technical knowledge of disease treatment. These models are then transferred to hospitals under the MoPH, which serve as test sites of the new models and technologies (*GA3, MPH2*). Both the DMS and the Thai FDA have the authority to initiate "sandboxes" to generate insights into management practices related to the adoption of new medical technologies where clear laws or regulations are absent. However, there is currently no instance of applying this sandbox framework for any real-world case study (*GA3*).

Universities possess the potential to serve as a fertile ground for the advancement of excellent medical AI innovation. Recently, there have been changes in the roles and expectations of higher education institutions in fostering innovation development. In February 2015, the Cabinet announced that research and innovation in collaboration with industries are part of the responsibilities of university professors under the Talent Mobility policy.

In 2021, the Ministry of Higher Education, Science, Research and Innovation (MHESI) announced that innovation development can be recognized as an indicator for academic position promotion (Committee of Civil Service in Higher Education Institutions, 2021). However, in practice, recognizing innovation work as part of the performance evaluation of faculty members still faces challenges in translating the policy into implementation. These challenges include the absence of standardized performance metrics (*UH1, UH5, UH6*) and a lack of recognition of the impact of the innovation work on the performance evaluation (*HE5*). These challenges are particularly pronounced in the faculty of medicine, where innovation development is not prioritized compared to teaching, research, and patient care services.

> *"We cannot really count the time spent on these tasks (development of AI application) as academic service. I think it is because they do not know how to measure it. It's just a small part of the department that receives this funding (and takes part in this project). When it comes to counting the work, there has to be an agreement on what tasks can be counted, except when this work is published as a research paper. . . . Even though the (AI) technology that we have developed is actually being used, there's no clear measurement or plan for measurement because not everyone is doing this."*
>
> (UH5, personal communication, May 29, 2023)

Guidance and Direction of the Search.

In addition to the National AI Strategy and Action Plan (2022–2027), the government and other state agencies have announced policies aimed at promoting the adoption of digital technologies to enhance public health in the country. For example, the government envisioned the country to become a prominent healthcare destination in Asia, a "medical hub" to attract international patients and medical tourists. Additionally, in 2018, the government introduced "smart hospital" policies to improve the quality of healthcare services by leveraging advanced technologies for analysis, diagnosis, and care planning (Pongtriang et al., 2023). Despite these policy directions, hospitals rarely reported the influence of government policy on their decisions to adopt AI innovations. One key informant explicitly reported the disconnection between the hospitals' decision to adopt AI applications and the country's AI technology strategy or MoPH policy.

> *"At the time we decided to implement it (the chest X-ray AI technology), the ministry's policies or regulations had no influence on our decision to adopt it."*
>
> (MPH8, personal communication, April 27, 2023)

Instead, the desire for adoption is more dependent on perceived resource availability for development, such as X-ray images for AI model training, and on specific users' pain points, such as the shortage of radiologists and the negative impact of the COVID-19 outbreak on the healthcare workers' workload *(UH1, MPH1, MPH9).*

Conclusion and Recommendation

This study, utilizing the TIS framework, investigates policy issues in AI adoption in Thai public health. The study found that the lack of consensus on benefit-sharing models in AI project partnerships and the absence of scalable business models could hinder widespread dissemination. Government procurement efforts are limited by a narrow range of products on the Innovation List, while high costs and a cumbersome FDA approval process further impede AI market entry. Although AI legitimation mechanisms exist, they lack operational clarity, such as clear justifications for using health data and processes for obtaining ethical approval in AI research. Resource deficiencies and inefficient allocation affect both the development and implementation of health-related AI technologies. Despite a supportive policy framework for developing and testing medical AI innovations, practical implementation is limited, and national policies may have yet to significantly influence hospitals' AI adoption decisions.

This study contributes to a better understanding of the impact of activities within the TIS on the adoption of AI in public health. It shows TIS activities could potentially influence innovation suppliers, users, and the mechanisms connecting the suppliers to broader user bases. The study provides insights for policymakers in designing better support for promoting the development and adoption of AI innovations in public health. Drawing from the findings, the MoPH should increase funding to regional health offices to facilitate the adoption of digital applications in public hospitals. The MHESI and the MoPH should jointly establish a structured framework for partnership management to facilitate multidisciplinary collaboration in innovation development.

The Board of Investment (BOI) and the Ministry of Industry should promote the growth of system integrator firms to result in AI service with sustainable business model. The FDA should streamline the process of certifying AI medical devices and focus on clear communication with developers and users regarding the legal requirements for registering medical AI-based equipment. Additionally, ethics approval for AI-related medical research should be streamlined to balance innovation with regulatory oversight.

Furthermore, government or medical professional associations should continue to organize public advocacy programs to promote understanding of medical AI. Experience of digital transformation in early adopter hospitals should also be shared among later adopter groups. Early adopters can trigger and stimulate the spreading of information or opinions about the experience of adopting innovation. This would lead to imitative behavior by the later adopters (Frattini et al., 2014).

This study encountered certain limitations. Firstly, the interviewees who are developers and adopters are limited to those involved with GI endoscopy and chest X-ray image AI. Compared with other types of AI, image-processing AI especially chest X-ray image analysis AI is among the most widely adopted by the healthcare sector in Thailand (Prasarnphanich, 2022). Other AI systems and/or areas of applications may exhibit different challenges to adoption (Petersson et al., 2022). Secondly, this study did not aim to explore comprehensive issues in the medical AI ecosystem but rather focused solely on issues that impact adoption. Therefore, it has not yet identified issues related to knowledge development and policy guidance.

Future research should explore the views of adopters utilizing other types of AI systems to enhance the generalizability of the study. Additionally, future investigations may specifically focus on studying policy issues related to the development of medical AI innovation, which is another goal of TIS function.

Conflict of Interest

The authors declares that there is no conflict of interest.

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Public-Private-People collaborative model on food waste management in metropolitan area of Thailand

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Abstract

Food waste has emerged as a critical issue in metropolitan cities globally, including Bangkok, where it constitutes 47 percent of the total annual waste generation. This multifaceted problem involves various stakeholders, including the public sector, private sector, and the general public. The research aimed to examine collaboration models among these sectors for effective food waste management in Bangkok, Thailand. Employing a Grounded Theory approach, data were gathered from four key informant groups: the public sector, private sector, people sector, and academics, totaling 25 participants. The interview process and observational surveys were carried out iteratively and continuously in tandem with data analysis until achieving theoretical saturation. The research findings indicated the existence of three collaborative models for managing food waste in Bangkok: 1) Structured collaboration, 2) Loose form of collaboration, and 3) Occasional collaboration. These collaborations are driven by various levels of developmental direction, benefits for involved parties, active participation of large private companies, as well as non-profit organizations. However, challenges persist, including unclear regulations and bureaucratic complexities, and a lack of awareness among the majority of the population regarding reducing and separating food waste.

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Introduction

Metropolitans, cities, and various places worldwide are facing the issue of food waste (Rochester Institute of Technology, 2019), which originates from wholesale and retail, service, and consumption (United Nations Environment Programme [UNEP], 2021) encompasses markets, shops, supermarkets, hotels, restaurants, and accommodation (Food and Agriculture Organization of the United Nations [FAO], 2011, UNEP, 2021). Concrete data on this food waste have been available since 2011, revealing that approximately 1.3 billion tons of food

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are discarded globally each year, equivalent to about one-third of the food produced for human consumption (FAO, 2011). Later, in the year 2015, the United Nations set a goal to reduce global food waste as part of the 12th Sustainable Development Goals (SDG 12), which aims to ensure sustainable consumption and production patterns. The third target under this goal calls for halving per capita global food waste at the retail and consumer levels, as well as reducing food losses along production and supply chains by 2030. This goal resulted in the development of a roadmap and action plan for food waste management in Thailand for the period 2023–2030. There is uncertainty about how to translate and apply these global and national targets to local practices.

This research area is Bangkok, the capital city of Thailand, which faces a similar problem of food waste. This is due to the lack of systematic management for discarded or spoiled food (Office of Natural Resources and Environment Policy and Plan [ONEP], 2019). Furthermore, Bangkok is a rapidly expanding metropolis with a registered population of approximately 5.49 million people at the end of 2022, and with a significant number of temporary residents and tourists visiting, this has led to a significant increase in solid waste. The amount of waste has risen from 8,943 million tons in 2011 to 9,519 million tons in 2020 although there was a reduction in waste during the COVID-19 pandemic in 2021–2022. (Bangkok Metropolitan Administration [BMA], 2023). The food waste in Bangkok still accounted for an average of around 47 percent of the total waste generated, which is approximately 4,500 tons per day. However, the food waste separation program initiated by the Bangkok Metropolitan Administration or BMA in 2023 only manages to handle approximately 85 tons per day (BMA, 2023).

Managing food waste is not a task that can be accomplished by any particular sector (UNEP, 2021). Thus, this research aims to examine the collaborative model among related stakeholders: the public sector, private sector, and the general public involved in managing food waste in Bangkok, and to provide recommendations for developing cooperation that reduces limitations and enhances the efficiency of Bangkok's food waste management, as well as its potential adaptation to other metropolitan areas.

Literature Review

The concept of collaborative management is applied to situations with complex or unclear boundaries, increased stakeholder involvement, lack of direct responsibility, or past management failures. In such cases, individuals turn towards each other to undertake various actions (Linden, 2003). This includes both vertical collaboration, involving collaboration within different levels of government organizations, both central and local, and horizontal collaboration, which involves collaboration among organizations in different sectors, both formal and informal (Agranoff & McGuire, 2003). It is crucial to establish relationships and define the roles of each relevant party (Thomson & Perry, 2006; Bryer, 2009).

A study by Agranoff and McGuire (2003) on the collaborative models of local governments in the United States identified several distinct models. These encompass models that create opportunities for organizations from all sectors to collaborate in achieving mutually beneficial objectives. Some models involve organizations with divergent goals collaborating due to resource deficiencies. The collaborative model varies, with organizations of higher potential collaborating with those of lower potential. Temporary collaborative models among organizations are also taken into account.

The Public-Private-People Partnership (4Ps) concept extends the Public-Private Partnership (PPP) model to address government budget constraints in large-scale projects (Asian Development Bank, 2008) and to tackle challenges related to public trust (Hui & Hayllar, 2010). According to Junqi (2012), the 4Ps concept significantly enhances the role of the public. In Thailand, the collaborative model known as "Pracharath" or Trilateral Collaboration, described by Kotsing (2017), focuses on mutual assistance to overcome constraints and improve opportunities for all involved parties. Similarly, Aramthiantamrong and Payomratanasin (2020) studied Trilateral Collaboration between public sector, non-government organization, and the general public, emphasizing the importance of the government taking the lead in initiating coordination and building partnerships with other sectors in environmental management in Bangkok.

Regarding the issue of food waste, there have been proposals to develop systematic public policies for managing food waste throughout the supply chain (Chunhachotianan & Onintha, 2017; Lipinski et al., 2013; Saiphet & Kantha, 2023). Consequently, involving various sectors is crucial. However, Bunjongsiri (2018) found that many people in Thailand perceive food waste as a distant issue unrelated to their daily lives, while the Thailand Environment Institute (2021) reported a general lack of awareness about waste reduction and sorting, despite some positive examples.

Previous research on food waste management has primarily focused on specific aspects and stakeholder groups, such as household consumers (Bunditsakulchai & Chen, 2021; Schanes et al., 2018; Srijuntrapun, 2016), event industry (Ungsumeth, 2021), hotel and restaurant business (Turasakun & Rugmai, 2021; Chaiyasain, 2023). Various research works consistently refer to the Food & Drink material hierarchy proposed by UNEP (2014), which emphasizes waste prevention, optimization, recycling, recovery, and disposal, in that order.

Methodology

This research employed the Grounded Theory qualitative research strategy, which is well-suited for describing phenomena and complex situations. It also aims to generate theoretical insights that have not been extensively explored before, following the framework of Strauss and Corbin (1998) and Hamid et al. (2012). The study emphasized the trustworthiness or rigor of qualitative research, incorporating methods such as member check and audit trail, as outlined by Shenton (2004).

Participants

Key informants were selectively chosen through purposive sampling based on their at least 5 years of experience in waste management or food waste management at the national level, or their experience working in the Bangkok area, along with their willingness to provide information for this research. They were from four sectors (1) public sector in both the Bangkok Metropolitan Administration (BMA) and related government organizations, (2) private sector, encompassing hotels, supermarkets, and markets, (3) the general public, including community leaders and representatives of non-profit organizations, and (4) academics. The sample size adhered to the guidelines of Grounded Theory research and the basic principles suggested by qualitative researchers (Joungtrakul, 2018). Subsequently, a snowball sampling method was used, resulting in a total of 25 participants.

Data Collection

This research employed in-depth interviews with a semi-structured interview format to collect data from key informants. Emphasis was placed on safeguarding privacy and confidentiality to protect the data providers. The interview process followed a continuous, cyclical pattern of data collection and analysis over approximately one year in 2022. Additionally, the researchers utilized observational methods to gather data by participating in meeting and seminar activities and observing various events in the area. This was complemented by a study of additional documents to support and augment the information obtained from interviews.

Data Analysis

This data analysis employed Conventional Content Analysis method based on Creswell (2013), proceeding through various steps of coding in a study aimed at theory generation using a Straussian approach, as guided by Hamid et al. (2021). The process began with open coding, extracting meaning from speech and assigning codes, followed by categorization. Axial coding involved linking or specifying relationships between categories. Selective coding then integrated data from axial coding to select the core category. Throughout this process, the researchers continuously recorded and analyzed data concurrently. Iterative movement back and forth occurred until achieving theoretical saturation, following the approach of Tie et al. (2019).

Results

From the study of stakeholders involved in food waste management in Bangkok, including the public sector, private sector, and the general public, various roles and collaboration patterns were identified as follows:

Roles of Stakeholders in Food Waste Management in Bangkok

The public sector, primarily represented by the government, is responsible for policy formulation and planning, while the Bangkok Metropolitan Administration (BMA), which is a local government agency, holds the authority for waste management in the Bangkok metropolitan area. Plans and projects fall under the development plan for Bangkok over a 5-year period, aligning with the national policy to promote green communities and green organizations as well as the SDGs target. A committee has been appointed to drive policies regarding the initial stages of waste management in Bangkok, involving various sectors. In this regard, the BMA set indicators to evaluate

the performance of district offices regarding the collection of organic waste for composting. There has been a campaign encouraging citizens to separate waste at the source. However, stakeholders observe that the emphasis has been on waste collection without adequate focus on prevention and reduction at the source. Despite subsequent efforts, the BMA declared a non-inclusion policy, urging citizens to separate food waste from general waste for composting, distributing the compost to farmers as animal feed. Nevertheless, Bangkok still lacks a comprehensive system to manage food waste systematically from its source to the final destination.

> "...The system of the Bangkok Metropolitan Administration (BMA) still does not support food waste, and the emphasis has been excessively on end-of-pipe solutions. The focus is on collection to prevent accumulation, with practices such as landfilling and incineration, but opportunities at the source are not adequately addressed."
>
> (Academic, researcher in food waste management)

The private sector is starting to become more aware of food waste management, as evident from interviews with representatives of major companies engaged in wholesale and retail of food and beverages. These companies reflect existing policies to prevent and reduce food waste, which not only helps cut costs but also involves segregating food waste for collection by BMA. Some companies utilize a portion of the separated food waste to produce their own organic compost, distributing it to customers.

Additionally, other private companies have begun to declare clear policies and goals for significant food waste reduction. They collect surplus food for donation to non-profit organizations, providing it to those in need. There are a few private enterprise support communities engaged in waste management initiatives, and several hotels have implemented food waste separation, utilizing it for animal feed and composting to contribute to environmental conservation and enhance their image. In some fresh markets, waste management aligns with criteria for preferred fresh markets, where vegetable and fruit scraps are separated. A portion of these scraps are used to produce organic compost for floor cleaning, significantly reducing the need to purchase cleaning products. The remaining waste is collected by district offices, resulting in minimal residual waste and helping reduce the fees associated with waste management significantly.

> "...Developing new menus to utilize ingredients efficiently, ensuring that the materials sent to the kitchen do not end up as waste in landfills."
>
> (Hotel Manager)

> "...Setting a goal for zero food waste to landfill by 2030 is being pursued through various means, including having each branch handle it themselves and teaching customers how to do it."
>
> (Sustainability manager, large scale supermarket business – 1)

> "Dried food items that are not sold or are close to expiration are carefully selected for quality and donated to those in need..."
>
> (Quality assurance manager, large scale supermarket business – 2)

However, the majority of the population still buys and consumes food without much caution, leading to a significant amount of food waste in households, particularly in the expanding condominium communities in Bangkok, which are major contributors to the substantial food waste generation. The primary issue identified consistently across various sources is that people do not separate waste at the source due to a lack of awareness about the problem. There is also a lack of confidence in Bangkok's waste management system, with the perception that waste management is the responsibility of the city, and a general lack of knowledge about appropriate food waste management practices. Only a few pilot communities have received continuous support from Bangkok's administration in waste management, resulting in effective food waste management in those specific communities.

> "The inadequate management of food waste is due to the fact that people dispose of food waste together with general waste, making it challenging to handle."
>
> (Academic who promotes food waste reduction in educational institutions)

> "...Villagers believe it is the responsibility of BMA and wonder why they don't increase the number of waste bins and improve the collection system."
>
> (Community leader advocating for waste reduction and segregation in the community)

Regarding the roles in managing food waste for the aforementioned sectors, collaboration between the

public and private sectors is primarily observed in the collection and disposal activities of generated food waste. There is limited collaboration in activities focused on the prevention and reduction of food waste. These activities are mostly in the early stages, with some pioneering initiatives in specific areas or branches of major private companies.

In addition to the roles of the three sectors defined in the research objectives-public, private, and people, this study also found that non-profit organizations play various roles in food waste management in Bangkok metropolitan area. Their important role involves receiving surplus food donations from the private sector and distributing them to low-income communities, shelters, and those in need. They also coordinate with businesses in a central part of Bangkok, to collect and manage the generated food waste by composting it to create fertilizer for growing organic vegetables.

Collaboration Models among the Public Sector, Private Sector, and General Public in Food Waste Management in Bangkok

Based on data collection and analysis, the researchers have identified collaboration models among the public sector, private sector, and the general public, including non-government organizations, in the management of food waste in Bangkok. The collaboration models can be categorized into three types, considering the relationships between stakeholders, resource sharing, and activities: 1) Structured collaboration, 2) Loose form of collaboration, and 3) Occasional collaboration, as shown in Table 1.

Structured collaboration

This is a form of engagement among stakeholders with specified involvement, assigned roles and responsibilities, and jointly conducted activities. It involves clear and explicit conditions or agreements, such as appointment announcements, collaboration records, joint funding agreements, and service contracts. This contributes to the development of a continuous and consistent plan of action or joint activities.

Structured collaboration is mostly observed in the cooperation between the BMA and private companies for waste collection and disposal services, as well as joint funding for waste-to-energy projects. Resources are shared according to legally binding contracts. Additionally, there is collaboration between the BMA and large-scale retail and wholesale private companies for the separation of food waste from supermarkets, utilizing it for composting and biogas production. Collaboration extends to hotels and restaurants working with public organizations, as well as cooperation between the government and non-profit organizations in receiving and distributing excess food to shelters and low-income individuals which are voluntary and have clear action plans in place.

> "…Executed an MOU between the BMA and the main office; thereafter, each branch worked collaboratively to tailor their efforts to the specific needs of their respective areas…"
>
> (Sustainability manager, large scale supermarket business - 1)

> "…Collaborated with the private sector; the process was not overly complicated. Signed an MOU, scheduled a date, and smoothly received donated goods…"
>
> (Project leader, non-profit organization receiving and redistributing surplus food)

With regard to a committee driving the waste management policy at its source in Bangkok, this collaboration involves the public sector, private sector, and the general public. The committee has clear appointments and defined roles, but practical implementation still encounters unclear and inconsistent activities.

Loose form of collaboration

This is a form of stakeholders working together with a common goal, characterized by flexibility and a lack of emphasis on rigid structures, clear relationships, or well-defined roles. It relies on closeness and trust, with each party benefiting from the collaborative activities, allowing the activities to progress continuously.

Table 1 Collaboration models among stakeholders in food waste management in Bangkok metropolitan area

Component	Structured collaboration	Loose form of collaboration	Occasional collaboration
Relationships	- Clearly define roles and responsibilities - Establish plans/activities - Formalize agreements in writing	- Flexible - Rely on closeness and trust	- Depending on the situation - Not clear
Resource sharing	- According to the agreement	- Reciprocal support	- One-sided giving and receiving, or - Not clear
Activities	- Continuous and consistent	- Continuous	- Short periods, or - End as needed

This loose form of collaboration is evident in collaborations between the BMA and other sectors, where district offices often play a role in engaging specific target groups, particularly communities, fresh markets, and familiar restaurants, in the separation and beneficial use of food waste. Non-profit organizations and private businesses also collaborate with restaurants to implement food waste separation for composting. This collaborative model is further observed between the private sector and the public, with instances like hotels and restaurants donating food scraps to agricultural partners for animal feed or compost creation. In some fresh markets, cooperation is established with merchants involved in waste separation through the distribution of bio-fermentation liquid.

> "...Doing it informally, it's more flexible and easier—no need to spend a lot of time on extensive documentation or numerous meetings..."
>
> (Co-founder, non-profit organization collecting food waste for composting)

> "...Farmers receive food scraps from us, and we get safe raw materials to use. Collaborating in this way is less complicated, similar to regular waste collection, but it's farmers who do the collecting instead of the city."
>
> (Administrator, environmentally certified hotel)

Occasional collaboration

This is a form of engaging in activities together based on specific situations or for a particular purpose. It occurs within a short period with a defined starting and ending point. It typically involves providing knowledge and advice on food waste management, supplying items or equipment for waste management, or making temporary donations of surplus food.

> "…As we earnestly turn food scraps into compost, private companies have taken notice. They provided biogas fermentation tanks, and the generated gas is then used in the kitchens of nearby households…"
>
> (Community leader, zero waste community)

Collaboration in various forms is driven by significant forces, including the mutual benefits for stakeholders, fostering a willingness to collaborate. This can manifest in cost reduction, contributing to a positive image, and providing emotional well-being benefits through shared responsibilities. Additionally, there is momentum from SDGs leading to the development of the country's food waste management plans. State officials responsible for national environmental policy state: "...previously, nobody acknowledged food waste, but with the SDGs target, discussing food waste has become easier." Policies on food waste separation from the BMA and targets for food waste from large retailers and certain hotel businesses have been announced. However, some stakeholders argue that district offices are working merely to meet targets, while most private sector entities are primarily driven by image-building without addressing the underlying complexities seriously.

However, there are still unclear and complicated regulatory and bureaucratic impediments of collaboration between the government and other sectors. Sanitation officers from district offices note: "...the work is limited by legal constraints and regulations that prohibit certain actions or involve potential risks. This makes district offices hesitant to proceed, fearing audits or disciplinary action..." Furthermore, most informants agree that the lack of appreciation for food leads to a significant amount of food waste being discarded from households. The failure to separate waste is also a crucial issue that complicates food waste management efforts.

Discussion

This research highlights the role of the BMA as a public agency at the local level that promotes food waste separation and responses for ensuring timely waste collection. As for the private sector, including supermarkets, markets, hotels, and restaurants, as indicated by FAO (2011), and UNEP (2021), recognized as significant contributors to food waste, some entities are found to be proactive and play a clear role in managing food waste. This aligns with findings from Aramthiantamrong and Payomratanasin (2020), emphasizing the importance of the private sector in environmental management. On the other hand, although consumers are substantial contributors to food waste generation, as highlighted by Srijuntrapun (2016), ONEP (2019), this research found that consumers play a minimal role in food waste management, aligned with findings from TEI (2021) and Bunjongsiri (2018).

The roles of stakeholders that emphasize the collection of food waste for beneficial use do not align with the Food & Drink material hierarchy proposed by UNEP (2014), except in cases where the private sector donates surplus food to non-profit organizations for distribution to those in need, contributing to a reduction in potential food waste.

The collaborative model among the public sector, private sector, and the general public in food waste management in Bangkok all follow the concept of horizontal collaboration, as proposed by Agranoff and McGuire (2003) and presented by Aramthiantamrong and Payomratanasin (2020). This approach aims to reduce the limitations of the government in managing food waste and to ensure that each sector benefits. It involves mutual cooperation where each sector turns towards each other to carry out operations, aligning with Linden's (2003) perspective and some local government collaboration models in the United States, as synthesized by Agranoff and McGuire (2003).

However, the research points out the lack of clarity in regulations and the complexity of the bureaucratic system, identified as obstacles in developing collaboration between the public sector and other sectors. These challenges, not found in previous research, lead to a more informal or occasional collaboration rather than structured cooperation. Despite suggestions by Bryer (2009), Carlssona and Berkesb (2005), Thomson and Perry (2006), that developing collaboration with the public organization requires clear relationship establishment and role definition for each party involved.

Conclusion and Recommendation

This research examines the collaborative model among stakeholders, including the public sector, private sector, and the general public in managing food waste in Bangkok Metropolitan area. The researchers developed a conceptual framework based on data obtained from interviews with various stakeholders and observations of related activities. The key findings were summarized and categorized into different data sets, as illustrated in Figure 1, providing an overview of the theoretical conclusions regarding collaboration among those stakeholders in food waste management in Bangkok metropolitan area.

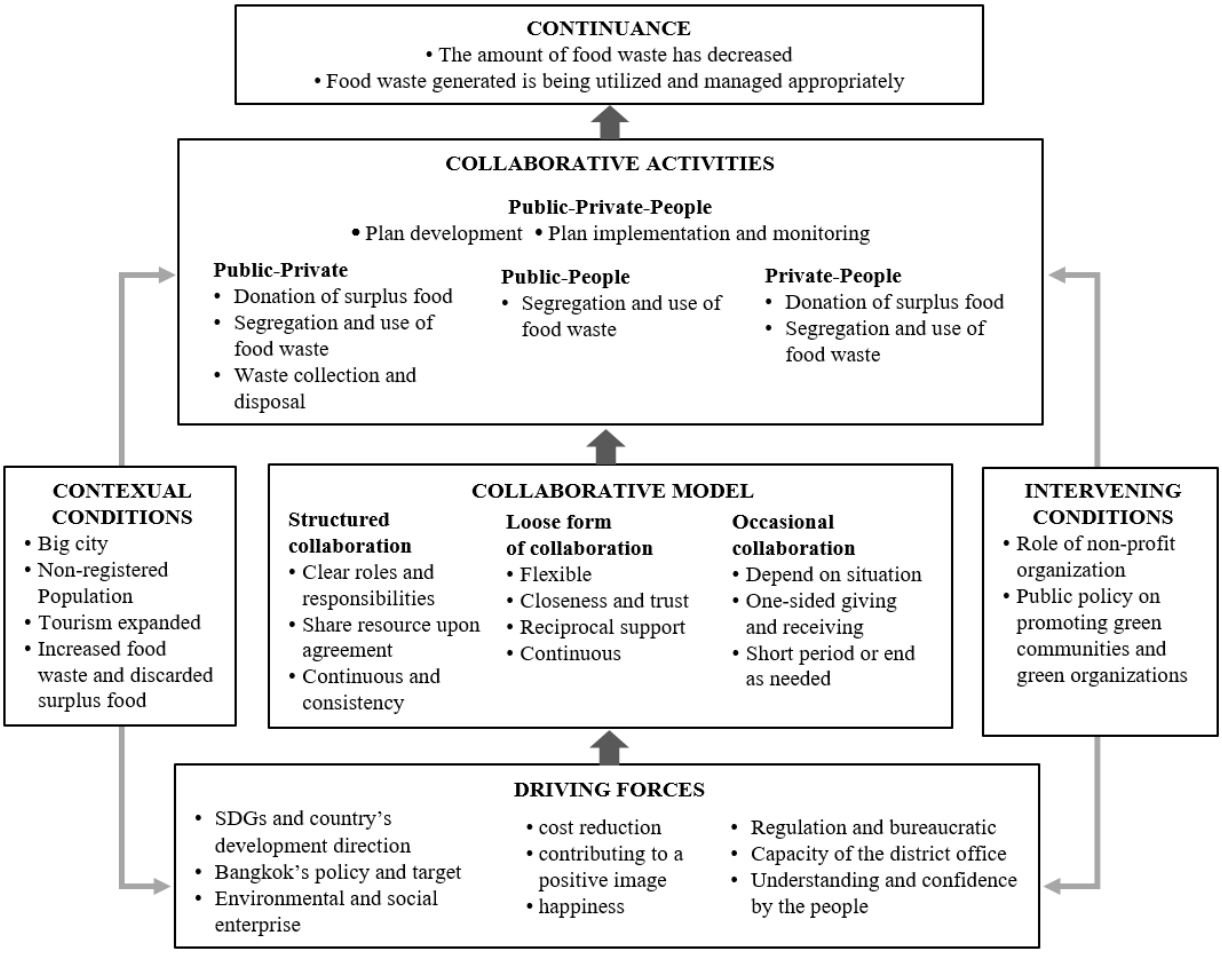

Figure 1 Theoretical conclusions of Public-Private-People collaboration in food waste management in the Bangkok metropolitan area

The collaborative model that has emerged is contextually influenced by local conditions stemming from economic expansion, tourism, and the complexity of urban society. This has led to an increasing trend in the volume of food waste. Significant intervention issues include a crucial role that non-profit organizations and public policy play in promoting green communities and green organizations. On the other hand, significant driving forces that negatively affect this issue include understanding and confidentiality, leading to poor waste separation behaviors. The other driving forces behind this collaboration stem from the benefits realized, guiding the development direction globally, nationally, and locally. Consequently, collaboration and various activities continue to evolve, characterized by creative processes, flexibility, adaptability, and mutual benefits for all parties involved. However, this collaboration and these activities are still within limitations, with many initiatives being in the initial stages of development and some operations in pilot communities requiring further expansion and community engagement for effective waste reduction and separation.

Policy recommendations for the development of collaboration in food waste management in Bangkok are as follows:

1) BMA should declare clear goals and guidelines for achieving food waste reduction targets for each sector, emphasizing increased responsibility at the source of food waste management.

2) The BMA should collaborate with public or private organizations specializing in communication to expedite efforts in preventing and reducing food waste, and to boost public awareness and participation in the proper management of segregated food waste.

3) Enhance structured collaboration between BMA and the private sector by implementing incentive measures and simplifying the process to better accommodate entities generating food waste.

4) Fostering a loose form of collaboration by decentralizing responsibilities to district offices and developing their coordination skills across various sectors and implementing activities tailored to each area.

5) Organize occasional collaborative activities and CSR initiatives related to food waste management that are appropriate for the situation or ensure continuity and achieve tangible results.

6) Review and improve regulations and processes within government agencies that hinder collaboration with the private sector, the public, and other sectors.

For future research proposals, it is recommended to investigate the collaborative model in food waste management at the sub-sector level, such as service, retail and wholesale trade, and consumer sectors. Additionally, conducting quantitative research would be valuable to identify and confirm factors influencing collaboration within these specific sectors more clearly.

Conflict of Interest

The author declares that there is no conflict of interest.

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Satire and mockery through political caricatures against Negara Indonesia Timur (the State of East Indonesia), 1946–1950

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Abstract

This article discusses satire and mockery of the State of East Indonesia establishment (SEI, 1946–1950) through political caricatures published in the pro-republic Revolutionary magazine. These mocking caricatures were one of the methods used by people who did not agree with the formation of the State of East Indonesia. There were other ways which had been done; demonstrations, motions of no confidence in parliament, etc. As historical research, this article uses several archives stored in the Jakarta National Archives, and the State of East Indonesia Archives which are stored in Makassar, South Sulawesi. Apart from archives, several newspapers published between 1946 and 1950 were also used. Satire and mockery were aimed at two things, namely (1) the process of establishing the SEI, which was the Dutch government's re-colonization project in Indonesia; and (2) the figures behind the SEI such as Hubertus van Mook, Charles Olke van der Plas, Soekawati, and Nadjamuddin Daeng Malewa. For pro-republican people, the establishment of the SEI and the figures behind it were nothing more than an attempt by the Dutch to return to their power in Indonesia which had been proclaimed on August 17, 1945.

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Introduction

The establishment of a federal state during 1946–1950 was an important phenomenon after the declaration of Indonesian independence. On the one hand, the emergence of numerous federal states was an indication of state euphoria, but on the other hand, it was a reflection of the numerous conflicts that occurred during the early years of the Republic of Indonesia's independence. The SEI was one of the federal states founded in 1946, with its founder Hubertus van Mook as 'Acting Governor-General of the Dutch East Indies'. (de Graaff, 1987; Husain, 2023a; Hoek, 2023; Oostindie, 2022).

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Different from several states in Indonesia such as the State of Pasundan (Frakking & Thomas, 2022; Suryadinata, 1991), the State of Madura (Matter, 1995), the State of East Sumatra (Pelzer, 1982; van Langenberg, 1982) which were geographically very small and homogeneous in political orientation, the SEI was a large state and its apparatus had very diverse and complex political orientations. However, based on various debates, intrigues, and disputes within the SEI, it was believed that the main current of these diverse political orientations was the establishment of an independent and sovereign Indonesian state. This was exemplified by the fact that the majority of participants demanded that the red and white flag be recognized as the state flag, the song Indonesia Raya be played, and so on (Husain, 2023b).

The fact that there were groups who wanted to make this state their political ideals and ultimate objective certainly could not be denied. However, along the pathway, this group had to acknowledge the determination of the State of East Indonesia people, including members of parliament, to pursue the unitary Republic of Indonesia as their ultimate political aim. With these different interests, throughout its existence, the SEI has never been devoid of conflicts of interest, both in parliamentary sessions and outside of parliament (Husain, 2023b).

Numerous motions of no confidence in the current governance were introduced during parliament debates, resulting in the cabinet's short tenure. Meanwhile, confrontations outside of parliament took various forms, including demonstrations, the distribution of leaflets and slogans, the publication of caricatures in newspapers, the display of posters in public places, and so on. All actions were intended to dissolve the SEI and return it to the Unitary State of the Republic of Indonesia. The execution of the Polombangkeng Proclamation was marked as the culmination point of these protests and demands (Husain, 2014).

Many studies have found caricatures to be a tool for social and political protest, however, no caricatures or slogans have ever been used to condemn the presence of the SEI. In fact, during the establishment of the SEI, there were several demonstrations and caricatures made by the public and community groups in the area of this federal state. As mentioned in the description above, the article aims to analyze caricatures as a medium for demanding and criticism of the existence of the SEI.

The main question is how are the mockery, anger, and protests over the SEI conveyed through caricatures? Who are the figures behind the formation of SEI who are the targets of mockery in the caricature? Through the study of caricatures, it can be seen that the debate about the SEI is not only conflict between groups that support and oppose the SEI, but many aspects that can be studied.

Literature Review

Agung (1996), Chaniago (2002), and Husain (2014, 2022, 2023) conducted studies on the SEI to provide a general understanding of the dynamics of this federal state. Gde Agung's publications record the history of the SEI, from its creation at the Malino Conference to the rise and collapse of various cabinets, starting with the first cabinet, the Nadjamoeddin Daeng Malewa Cabinet, to the last cabinet, the Ir Cabinet. J. Potoehena. Unfortunately, this book does not record various acts of rejection of the union state, whether carried out in parliament or the form of public demonstrations, including the display of posters and caricatures. The same thing is not found in Chaniago's writings. Chaniago only briefly examined the influence of local leaders in the dynamics of two regions: South Sulawesi and East Sumatra. In other books, such as Kahin's Nationalism and the Indonesian Revolution (1952) and Abdullah's Indonesia in the Flow of History (2012), the existence of the SEI is not given significant emphasis.

In these various short articles, states including the SEI are always considered merely as puppet states of the Netherlands, and there is no analysis of posters or caricatures as a form of anti-SEI. Meanwhile, a study conducted by Husain in 2014 highlighted the significance of political changes, especially the establishment of the SEI on the labor movement during the 1946-1950 period. Meanwhile, the study conducted in 2022 focuses on the debate in parliament between the progressive faction which tends to be pro-republic, and the development faction which wants the SEI to remain standing. Unfortunately, despite having the same core of rejecting the presence of the SEI, Husain's writing does not pay special attention to the appearance of many posters and caricatures as an expression of rejection of the SEI.

Several individuals have utilized caricatures and cartoons to protest against power (Ahmad, 2001; Ersyad, 2020; Istiqomah & Sofyan, 2015; Laksono, 2005; Supriadi et al., 2019). In 2018, for example, Nur Rofa et al. (2018) released a paper titled "Political Cartoons in the Independent Daily in Indonesia during the Independence Revolution (1945-1947)". The article, which uses a caricature published in the *Harian Merdeka* newspaper as the subject of research, demonstrates that

the cartoon is a statement of resistance to imperialism, particularly against the Dutch, who sought to reestablish their dominance in the Republic of Indonesia. These caricatures generally contain anti-imperialist propaganda and implicitly invite the Indonesian people to unite together to fight imperialism to defend the independence of the nation. The caricatures that had been published can be divided into four major themes: (1) revealing the cruelty of the enemy, (2) encouraging the spirit of resistance, (3) mocking NICA-Netherlands, and (4) Indonesia, the Netherlands, and the International World. Temporally, this article has a connection with the temporality of my research, namely, 1946-1950, but unfortunately, Nur Rofa et al does not show any caricatures or cartoons that make the SEI a target for criticism.

Another article that uses caricatures and cartoons with a background of historical events as an object of study is the book written by Duta Fikra Abdul Hamid (2020). The book entitled "Posters of the Indonesian Revolution 1945–1950" uses posters published in newspapers and several archives as study material. These newspapers include *Kedaulatan Rakjat*, *Sinar Hindia*, *Asia Raya*, *Soeara Rakjat*, and *Seniman*. Unfortunately, even though the study period overlaps with the period that I would be researching, no posters were found that used the SEI as study material.

A political caricature that also uses historical events as material is Choirul Azmi's writing with the title "*Karikatur politik Star Weekly pada masa demokrasi liberal*" (Star Weekly Political Caricatures in the Liberal Democracy Era) (2021). Through this book, Azmi shows the intensity of the caricatures used in newspapers by politicians and community groups in voicing their protests over the colonial situation. Frequent cabinet changes in 1945–1950, inappropriate policy-making, the Asian-African Conference and the 1955 General Election were some of the problems used as material by *Star Weekly* caricaturists.

Studies that focus on caricatures published in newspapers or magazines are significant for understanding how people express their "anger" through political caricatures. These caricatures were published not only in various newspapers and magazines but were also posted on buildings or public places, however, in this article, we only use caricatures published in the *Revolusioner*. The protests of society and political groups represented through political caricatures eventually resulted in the dissolution of the SEI in 1950. All federal states were dissolved and merged into the Unitary State of the Republic of Indonesia.

Methodology

This is historical research using material objects in the form of caricatures that were published in the *Revolusioner* in 1947, shortly after the establishment of the State of East Indonesia. "Revolusioner" is a magazine published by Pesindo or Indonesia Socialist Youth. Pesindo is a youth organization that adheres to the principle of socialism to uphold the Republic of Indonesia based on the sovereignty of the people. The use of caricatures published in various newspapers has been used by several historical researchers to analyze certain historical events, especially those related to political dynamics that occurred in a certain period as done by Zara (2021, 2024) and Suwirta (2015).

Caricature is derived from the words cartoon (English), and cartone (Italian), which means "paper" or picture. A cartoon is a depiction or symbolization shown in a satirical way, an allusion in a humorous expression (Laksono, 2005), whereas according to its lexical meaning as contained in The Advanced Learner's Dictionary of Current English: "*Cartoon is a drawing (e.g. in newspaper or magazine) dealing with men and events (esp. politics) in anamusing way; a moving picture made of such drawings"* (Hornby et al., 1958). Aside from that, it is possible to deduce that drawings that evolved into caricatures were satires on political developments or persons who were "architects" of specific political developments or events.

As historical research, apart from using caricatures published in the Revolutionary Magazine, this research also uses written sources, especially archival documents of the Netherlands East Indies Forces Intelligence Service (NEFIS) or Dutch intelligence archives. This archive contains classified reports collected by Dutch intelligence regarding the situation and movements throughout the period 1945-1950. Apart from that, the SEI archives stored at the South Sulawesi Archives office in Makassar and the Jakarta National Archives also hold a lot of information related to this research topic. Apart from archival sources, various newspapers published at that time should be taken into account. Newspaper reports at that time were based on firsthand reports from journalists working in the field, ensuring that this type of source was extremely valuable. These newspapers include Soeloeh Ambon and Pelita Rakjat. After all sources had been gathered, they were identified and verified, as well as external and internal criticism. External criticism aims to ensure the authenticity of the source, while internal criticism seeks to prove that the testimony contained in

a source is reliable. In other words, internal criticism focuses on the information or statements contained in the source (Pradadimara et al., 2022). After validating all of the sources, an analysis was conducted taking into account the political environment of the time.

Result and Discussion

Protest Against the Establishment of the State of East Indonesia

Following the failure of several negotiations between the Indonesian side, represented by Prime Minister Sjahrir, and the Dutch side, represented by van Mook, van Mook decided to focus on constitutional arrangements beyond the borders of the Republic of Indonesia. The first step was to host the Malino Conference from July 16 to 18, 1946, which was attended by members from the Dutch government and the Eastern Region of Indonesia. (Presiden kita P.J.M. Tjokorde Gde Rake Soekawati melawat dari poelau ke poelau di N.I.T., n.d.). Furthermore, on November 12, in Linggarjati, the Dutch acknowledged de facto of Java, Madura, and Sumatra area. In addition, On January 1, 1949, the Dutch and Indonesian governments agreed to establish a United States of Indonesia connected in one Indonesian-Dutch Union.

The Linggarjati Agreement contributed to the establishment of the State of East Indonesia. For this reason, on December 7–24, 1946, the Denpasar Conference was held, attended by representatives of the State of East Indonesia people, to establish constitutional unity within an independent and sovereign Indonesian stated by paragraphs 2 and 4 of the Linggarjati agreement. In the Greater East region (East Indonesia) there were 115 *lanschappen* (territory controlled by a king who recognized the power and sovereignty of the Dutch government through a political agreement) out of 298 *lanschappen* throughout Indonesia. The number of representatives presented was 70 people from 13 regions, namely: 1) South Sulawesi; 2) Central Sulawesi; 3) North Sulawesi; 4) Minahasa; 5) Sangihe-Talaud; 6) North Maluku; 7) South Maluku; 8) Timor; 9) Flores; 10) Sumba; 11) Sumbawa; 12) Lombok; and 13) Bali. Of the 70 delegates to the congress, 55 were elected by the people of each region and 15 were appointed by the Dutch government. The purpose of this congress was to continue the ideals of the Malino Congress and the Pangkal Pinang Congress, as well as realize the decisions in the Linggarjati Agreement. After negotiations lasted for seven days, on December 24 1946 the SEI was established with its capital city Makassar (Agung, 1996; de Waal, n.d.; Husain & Horton, 2023; Moe'tamar, 1946; Oostindie, 2002; Reid, 2010).

The SEI's future evolution was not without its challenges. In the years after the Malino Conference and the Denpasar Conference, the divide that had begun to appear became more pronounced. Motions of no confidence in the present administration gained popularity, ensuring that no single cabinet could remain long.

The political atmosphere in Makassar was quite stable at the beginning of the transfer of sovereignty (27 December 1949), but it did not last long. Around the end of January 1950, various actions demanding the dissolution of SEI increased. The cabinet led by J.E. Tatengkeng (27 December 1949–14 March 1950) was the first SEI cabinet within the RIS and D.P. Diapari (14 March–10 May 1950) was under constant pressure to disband the SEI. Diapari's cabinet was even forced to step down after ruling for only approximately 64 days.

Between January and May 1950, the unitary group organized several actions demanding the dissolution of the SEI, either through demonstrations, general meetings, or through pamphlets. At least 12 pamphlets were found demanding the dissolution of the SEI. Apart from putting up pamphlets, demonstrations, and giant meetings were also held. Similar actions also occurred in Gorontalo, Poso, Donggala, Takalar, Jeneponto, and others. In fact, on April 17, 1950, in Polombangkeng (south of Makassar) a proclamation took place which stated that it would free itself from the authority of the Law and the SEI Government and would maintain the SEI's areas as part of the Republic of Indonesia (Archive: Arnas. Perw. Sul-Sel, East Indonesia Government Archives 1946–1950, Reg 153).

Satire and Ridicule of the State of East Indonesia Establishment

As stated in the previous section, the establishment of the SEI received opposition from various groups, especially pro-republican community groups. This opposition was carried out through various means such as demonstrations, boycotts in parliamentary sessions, and a motion of no confidence in the ruling SEI cabinet (Agung, 1996; Chaniago, 2002; Husain, 2023a). However, what was interesting was that this opposition was not only carried out through debates in parliament or elsewhere but also caricatures or cartoons.

Of the several caricatures related to protests against the SEI, four caricatures were representative enough to depict objections from various parties to the federal state, especially pro-Republican groups.

Fugure 1 published in the 1947 in *Revolusioner* reads: V. Mook: "Look, the statue that we carved is ready. What a blessing." It appears that van Mook, who was standing to the right of the statue, delivered the statement to van der Plas, who was positioned to the left of it. Meanwhile, the statue created symbolizes Tjokorda Gde Rake Soekawati, who became president of the SEI following its establishment at the Denpasar Conference on December 18–25, 1946. Soekawati was Bali's son, born on January 15, 1899. According to Picard (2002), Soekawati was elected over Nadjamoeddin Daeng Malewa and Tadjoeddin Noer due to his considerable influence and status as a "leading representative of the Balinese ruling family". He was the son of the famous Ubud ruler Tjokorda Gde Soekawati. His title, Tjokorda Gde, shows that he was the highest knight from one of the four noble castes in Bali.

Meanwhile, Charles Olke van der Plas (1891–1977) was a civil servant in the Dutch East Indies who served as Governor of East Java until Japan conquered the Netherlands in 1942. He also served as chairman of the Dutch East Indies Commission for Australia and New Zealand, which advocated for Japan's departure from the Dutch East Indies. When the Pacific War ended in October 1945, van der Plas returned to Java from exile in Australia as Chief Civil Affairs Officer, escorting allied soldiers (Zara, 2021). Van der Plas was van Mook's right-hand man and, at the time, the Deputy Governor-General of the Dutch East Indies. Given his position, it was not unexpected that van der Plas was always accompanying van Mook. In addition, Van der Plas was a Netherlands civil servant in 1908 and served as the Netherlands consul to Jeddah in Saudi Arabia. He was influenced by the Netherlands Islamist scholar Christiaan Snouck Hurgronje and became an expert in Indonesian society and politics, Islam and Arabic.

Figure 1 The State of East Indonesia (Negara Indonesia Timoer) in *Revolutioner*, 1947

The month in which the caricature was published is unknown, however considering that the SEI was created on December 24, 1946, it is reasonable to believe that it was published in early 1947. The caricature depicts Van Mook's achievement as the mastermind behind the establishment of the SEI. This is evident from the quote underneath the photo, which appears to have been said by Van Mook. Aside from the quote "Van Mook's words", the statue's caricature represents two layers. First, there is a larger statue, followed by another in front of the smaller figure. The first statue represents the Federalist group's "victory," while the second statue depicts a unitarist or republican group wearing a skullcap, kneeling helplessly in front of the Federalists.

Figure 2 illustrates the tight relationship between two SEI leaders, President Soekawati and Prime Minister Nadjamoeddin Daeng Malewa, with van Mook standing next to him. The great thing about this caricature is that it captures the actual style of the SEI. This is evident in the comments by President Soekawati when hugging Prime Minister Nadjamoeddin Daeng Malewa. The sentence reads:

> Hoezee!!
> Nadjamoeddin's speech. Mynheer de President van Oest Indonesia … Long Live de Koningin. Long Live Dr. V. Mook…Hoezee!!
> In Den Pasar (Bali) Van Mook has printed "New State", which is the state of East Indonesia with "President" Soekawati and "Prime Minister" Nadjamoeddin Daeng Malewa.
> The caricature on the side shows what the "new state" actually looks like.

Figure 2 Hoezee in *Revolusioner* 1947

According to the caricaturist, this was the SEI's style, since it continued to honor the queen and van Mook. Pro-republicans thought that the Dutch government, through van Mook, was working hard to use the SEI as a tool for reasserting power, particularly in East Indonesia, as well as an "incubator" for other nations. As a result, there was a tremendous split between advocates of the SEI and those who opposed it.

Initially, there were numerous directions, which later became factions. Mr. S. Binol refers to this polarization as the Noor directions and Soekawati directions, as well as the Noor flows and Soekawati flows (Roendingan Badan Perwakilan Sementara Negara Indonesia Timoer; sidang pertama 1947, 1947). In parliament, these two groups combined to form two factions: the Development Faction and the Progressive Faction, both of which opposed the government, whose first cabinet was led by Prime Minister Nadjamuddin Daeng Malewa, who was supported by the Development Faction.

Mockery of the Figure Behind the SEI

The SEI's creation and Dutch colonial recolonization activities in Indonesia were inextricably linked to the efforts of various Dutch political figures, including Hubertus van Mook, Charles Olke van der Plas, and Simon Hendrik Spoor. Spoor was the Chief of Staff of the Royal Netherlands East Indies Army and the Royal Dutch Army in the Indies who commanded various attacks on Indonesian fighters. As depicted in Figure 2 (left), numerous of these figures were mocked by caricaturists. Here are the sentences from the caricature: "The Dutch-led combination brought death to Indonesia. VAN. Mook: Great leader; v.d. Plas: Islamic; Helfrichs: The instigator; Spoor: the slaughterman"

Figure 3 "Dutch Leadership Combination" in the *Revolusioner*, (Th. II, No. 4, 1947)

Figure 4 depicts the roles fulfilled by each Dutch character. Van Mook, for example, was the most frequently referenced character in numerous sources as the creator of Dutch recolonization attempts in Indonesia, as well as the primary role in the establishment of several federal states. Van Mook was a key figure not only in the establishment of the SEI but also in parliamentary sessions, particularly in calming pro-republicans who wanted the song Indonesia Raya to be played and the red and white flag to be used as the SEI flag.

Van Mook was also the target of ridicule in Figure 4. The sentence in the caricature is: "*Does it feel muddy?, Safe-Tranquil-Everything Goes Well!, Indonesian Republic Dutch Propaganda, Netherlands Population Area"*. The caricature illustrated van Mook's propaganda that everything was safe under Dutch sovereignty. Van Mook had various contentious policies. One of these measures was his proposal of an imaginary boundary separating Dutch and Indonesian lands during the Independence Revolution. The boundary was established following the First Mary Aggression, which violated the provisions of the Renville Agreement (Kahin, 1952). The van Mook Line, as it became known, sought to define Indonesia's destiny before Indonesia and the Netherlands established a definitive agreement. Van Mook favored limited independence for the Dutch East Indies or Indonesia.

Van Mook's influence on the formation and structure of the state of Indonesia, especially in the revolutionary period (1945-1950), was enormous. Five years later, what van Mook did is still discussed through a caricature published in *Star Weekly* on August 13, 1955 as seen in caricature number 5.

Figure 4 "Does it feel like muddy, bro?" in Revolutioner, Th. II, No. 28, 1947

In Figure 5 there are three caricatures that all depict van Mook. The caricature drawn by Ramelan can be explained as follows. First, a person wearing glasses is squatting and holding a chicken cage that reads "*pendjadjahan*" or colonialism. Meanwhile, in the middle of the cage in the position where the prey is trapped, there is a rooster with the inscription "Republic of Indonesia". The rooster was pecking at its food with the words "Renville and Linggarjati" written on it.

Figure 5 Karikatur Sebagai Alat Perjuangan in *Star Weekly*, August 13, 1955

What is depicted in the caricature again wants to say how big a role van Mook played in the political constellation after the 1945 proclamation. If we look at van Mook's role after the Renville and Linggarjati agreements, it appears that the unilateral actions he took led to the heating up of government in Indonesia (Kahin, 1952). The caricature is also like an alarm that is to be sounded to warn someone that they are in danger. If the rooster with the inscription "Republic of Indonesia" enjoys what he eats too much, namely, the Renville and Linggarjati agreements, then the "*pendjadjahan*" or colonialism confinement that van Mook is holding can catch him (Azmi, 2021).

As seen in the first caricature, the second caricature also focuses on van Mook leading an orchestra or musical ensemble. Van Mook is like a composer who creates or composes a song (music). The five people who were standing in front of van Mook with their hands behind them were Wiranatakusuma as the Head of Pasundan State, Sultan Hamid of West Kalimantan, Abdul Kadir as Deputy Lieutenant Governor General, Mansoer of North Sumatra State and Soekawati as president of East Indonesia. On the back of van Mook's body there is a cannon and a bayonet that is ready to be drawn and on the upper left there is the inscription "Let's Promise: Song of Indonesia United" (Azmi, 2021).

All caricatures depicting the period 1946–1947 actually want to explain that the Kingdom of the Netherlands has succeeded and was able to control, and control the entire Eastern Archipelago and almost all areas that produced export commodities in Java and Sumatra (Anderson, 2000). The control and establishment of a federal state only benefited the Netherlands, both from economic and political aspects. In addition, what is depicted in the caricature is the situation when van Mook succeeded in weakening Indonesia's combat power and politics by turning it into a state or union.

Conclusion

The establishment of the SEI was a major effort of the Dutch government, led by Hubertus van Mook and Charles Olke van der Plas. However, the creation of this federal state, which was physically the largest and had highly different political orientations, has sparked protests since its inception. Some of these protests were expressed openly, while others were wrapped in caricatures published in pro-Republican journals.

For the people, particularly republicans, the construction of this federal state was a strategy for the Dutch colonial government to retake control of Indonesia. The SEI was a prototype project for the establishment of various federal states following Indonesian independence. As a result, if this pilot project was successful, it would be simple to construct and operate in other federal states.

Throughout its journey, and even during its inception, this federal state faced several protests from citizens, particularly those who wanted to remain under the auspices of a unitary state. This group is often referred to as the unitarist group. Meanwhile, those who wished to remain within the jurisdiction of the Dutch kingdom were referred to as federalists.

Caricatures were a common tactic utilized by the anti-SEI community to launch their campaigns. Caricatures were used to mock the elite figures responsible for the construction of the federal state. These individuals include van Mook, van der Plas, Soekawati, and Nadjamoeddin Daeng Malewa. Van Mook was the primary architect behind the founding of the SEI, and van der Plas was his right-hand man who accompanied him on numerous occasions. Meanwhile, Soekawati was the President of the SEI, and Daeng Malewa was the Prime Minister. Given their significant positions, it was hardly surprising that the four of them were mocked in various caricatures published in nationalist journals.

A study on the use of caricatures as a medium of protest over the establishment of the SEI and the figures behind it has never been conducted. In fact, the use of caricatures was rampant at that time through several newspapers that were anti-SEI. However, the study did not have further access to newspaper sources containing various caricatures stored in the National Archives of The Hague Netherlands. Therefore, further research that uses caricatures and other forms of ridicule such as pamphlets is urgently needed.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Review Article

Integration of Theravāda Buddhist wisdom and virtue for sustainable development in the 21st century

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Abstract

This paper aims to point out the integration of Theravāda Buddhist wisdom and virtue for sustainable development in the 21st century. Buddhism, with its rich philosophical and ethical foundations, has long been recognized for its potential to contribute to personal and societal well-being. However, in the face of contemporary challenges such as globalization, rapid technological advancements, and environmental crises, there is a need to adapt Buddhist teachings and practices to effectively address these issues. The integration proposed in this paper advocates for the specific Buddhist teachings into the sustainable development framework, focusing specifically on the cultivation of wisdom and virtue. It recognizes the interconnectedness of individuals, societies, and the environment, and seeks to foster holistic development that balances material progress with spiritual well-being. Drawing on traditional Theravāda teachings, the integration emphasizes the importance of mindfulness, wisdom, and ethical conduct as the foundation for personal and collective transformation. It explores how these principles can be applied in various spheres of life, including education, economics, governance, and environmental stewardship. The integration of Buddhism into sustainable development involves adapting traditional practices to contemporary contexts while preserving their essence and authenticity. Integrating Buddhism into the sustainable development discourse thus contributes to the holistic well-being of people and the planet in the 21st century and beyond.

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Introduction

In the 21st century, societies around the world are grappling with numerous challenges, ranging from environmental degradation to social inequality and technological disruptions. The discussion topic at the 76th United Nations General Assembly was mainly on sustainable society and sustainable development (Heal with Buddhism, 2021). The sustainable development goals (SDGs), define the world we desire, and the aim of SDGs is to transform the world, to end poverty and inequality, to protect the planet, and to ensure that all people enjoy health, justice, and prosperity (World Health Organization, 2023). The Sustainable Development Goals are designed to be a blueprint to achieve a better and more sustainable future for all. The teachings of Buddha are seen identical with several markers of the SDGs (Dhakhwa, 2020). Buddhism has the potential to link sustainable development at all levels, i.e., individual, national, and global (Verma, 2023). Thus, to achieve the SDGs, Buddhists must develop wisdom and virtue in order to live with happiness and harmony in the world we desire. The adaptation and integration of Buddhism with the indigenous, self-reforming and directing activities to the secular life is reported. Furthermore, Buddhist teachings not only have an impact on Buddhists and the believers but also have the power to spread to the society (Pham & Nikolaeva, 2021) in various dimensions. Considering the academic gap, though many papers focused on integrating Buddhism as a solution, a few focused on an integrated approach with specific principles of wisdom and morality to reflect holistic well-being, ecological awareness, and social harmony. As these issues continue to unfold, there is a growing recognition that sustainable development requires a holistic approach that encompasses not only economic progress but also the cultivation of wisdom and virtue within individuals and communities. In this context, Buddhism, with its profound philosophical and ethical teachings, offers valuable insights and practices that can contribute to the sustainable development agenda.

This paper presents an integration of Theravāda Buddhist wisdom and virtue for sustainable development in the 21st century. Theravāda Buddhism, originating in South Asia, is now widely practiced in various parts of the world and is known for its emphasis on personal transformation, ethical conduct, and the pursuit of wisdom (Bodhi, 2005). The integration of Buddhism into the sustainable development discourse can enhance the potential of Buddhist teachings to harness multifaceted challenges in the modern era. The integration recognizes the need to adapt Buddhist principles and practices to the contemporary context without compromising their essence and authenticity. It seeks to explore how Buddhism can contribute to sustainable development in areas such as education, economics, governance, and environmental stewardship. By integrating the wisdom of Buddhism, individuals and communities can develop a more holistic and compassionate approach to these domains, leading to greater well-being and flourishing for both people and the planet.

In Buddhism, the Noble Eightfold Path can also be summarized as the Three Noble Disciplines of moral conduct or discipline (*sīla*), meditation or concentration (*samādhi*) and wisdom (*paññā*) (Davids & Stede, 2009). The core of the integration is the understanding that sustainable development is not solely about material progress but also about the cultivation of inner qualities and values that promote harmonious coexistence and long-term flourishing. Buddhism offers a rich array of teachings and practices that emphasize mindfulness, wisdom, and ethical conduct as transformative forces for personal and societal change. By integrating these principles into sustainable development efforts, it becomes possible to foster a more balanced and sustainable approach to progress.

Furthermore, this integration acknowledges the importance of interfaith dialogue and collaboration in the pursuit of sustainable development goals. It recognizes that Buddhism is just one of many spiritual and philosophical traditions that can contribute to a more holistic understanding of sustainable development. By engaging in dialogue and collaboration with diverse stakeholders, including practitioners of other faiths, policymakers, and civil society organizations, Buddhism can enrich the sustainable development discourse and foster a more inclusive and pluralistic approach to addressing global challenges.

In conclusion, an integration of Buddhism for the sustainable development of wisdom and virtue within the Theravāda tradition in the 21st century can be processed by integrating Buddhist principles and practices into the sustainable development framework. Individuals and communities can cultivate wisdom, compassion, and ethical responsibility, and thus contribute to a more holistic and sustainable future. This integration recognizes the interconnectedness of individuals, societies, and the environment and offers a comprehensive framework that promotes the well-being of people and the planet in the face of contemporary challenges.

Wisdom and Virtue: What are They in Theravāda Buddhist Perspective?

In Theravāda Buddhism, on one hand, the concept of wisdom holds a profound significance on the path to enlightenment. Wisdom, or "*paññā*" according to Paññā Sutta meaning "insight" or "understand" (Masefield, 2000), is regarded as one of the three essential components of the Noble Eightfold Path, which is the path towards liberation from suffering and the attainment of enlightenment (Ñanamoli, 2010), alongside ethical conduct and concentration. It encompasses a deep understanding of the true nature of existence, the causes of suffering, and the path to liberation. Wisdom in Theravāda Buddhism is augmented through various practices, including mindfulness, meditation, and the study of Buddhist teachings, such as the Four Noble Truths, and the Three Characteristics of Existence are impermanence, satisfactoriness, and non-self (Ñanamoli, 2010).

This wisdom is not simply theoretical knowledge but requires direct experiential realization through one's own insight and discernment. It involves seeing things as they truly are, free from delusions and misconceptions. By developing wisdom, practitioners can gain liberation from the cycle of birth, death, and rebirth, transcending suffering and attaining the state of enlightenment, known as Nirvana. Wisdom in Theravāda Buddhism is not limited to intellectual understanding but is a transformative and liberating force that leads to profound insight and ultimate freedom. Wisdom (*paññā*), with ethical discipline and meditative concentration, is one of the three main aspects of Buddhist training. It encompasses the right view and right resolve factors of the path, especially the form of right view that goes beyond the right belief. It not only guides other aspects of the path but is also perfected at the end of the path (Ñanamoli, 2010). It also needs to be in balance with the faculty of faith.

On the other hand, virtue, generally known as "*sīla"* according to Sīlavanta Sutta meaning "virtuous hermits" (*sīlavanto*) (Woodward, 1979) or "*guṇa-dhamma*" in Theravāda Buddhism, is a foundational concept that plays a crucial role in the spiritual development and liberation of individuals. It encompasses a set of ethical principles and practices aimed at cultivating moral integrity, compassionate action, and harmonious living. The concept of virtue holds significant importance in Theravāda Buddhism, as it provides a framework for personal conduct and serves as a guide for practitioners on their path to enlightenment.

Theravāda Buddhism emphasizes the cultivation of virtue as a means to purify the mind, reduce suffering, and create conditions conducive to spiritual growth. The teaching of Theravāda Buddhism upholds the equality of all sentient beings, and directs people to a virtuous and blessed life (Chung, 2023). The Five Precepts, a fundamental aspect of virtuous conduct, outline the ethical principles that practitioners strive to uphold. These precepts include refraining from harming living beings, stealing, engaging in sexual misconduct, lying, and intoxication. By adhering to these precepts, individuals develop a sense of moral responsibility and contribute to the well-being of oneself and others.

Practicing virtue in Theravāda Buddhism extends beyond mere adherence to external rules. It involves developing inner qualities and attitudes that support virtuous behavior. Mindfulness, an essential practice in Buddhism, plays a crucial role in cultivating virtue. Through mindfulness, individuals become aware of their thoughts, speech, and actions, allowing them to make conscious choices aligned with virtuous principles. By being in the present moment, practitioners can observe their intentions and motivations, ensuring they arise from a place of compassion and wisdom (Anuruddhā, 1994) at that particular moment.

Virtuous qualities in the sense of *guṇa-dhammma* such as generosity, compassion, patience, honesty, and loving-kindness can give broader implications than just morality and are highly valued in Theravāda Buddhism. Generosity, or "*dāna*" involves the practice of giving without attachment, cultivating selflessness and compassion towards others. Compassion, known as "*karuṇā*" is the deep understanding of the suffering of oneself and others, coupled with the active desire to alleviate it. Patience, or "*khanti*" allows individuals to endure difficulties and challenges with equanimity, fostering inner resilience. Honesty, or "*saccā*" involves speaking truthfully and living with integrity, while loving-kindness, or "*mettā"* is the cultivation of unconditional love and goodwill towards all beings (Buddhaghosa, 1969) on the basis that everyone needs love.

The practice of virtue in Theravāda Buddhism is being challenged in modern society. The complexities of modern life and societal pressures can pose obstacles to upholding virtuous conduct. Nonetheless, the teachings of Theravāda Buddhism can provide guidance on how to navigate these challenges. Regular meditation practice, which strengthens mindfulness and self-awareness, enables individuals to overcome temptations and make wise choices aligned with virtuous principles. Additionally, engaging with a supportive spiritual community can offer guidance, encouragement, and accountability in the cultivation of virtue.

The benefits of practicing virtue in Theravāda Buddhism extend beyond personal well-being. By embodying virtuous qualities and engaging in compassionate action, individuals contribute to the welfare and happiness of society as a whole. The cultivation of virtue creates a ripple effect, inspiring others to follow a path of ethical conduct and compassionate living. It promotes harmony, fosters social cohesion, and reduces conflict, ultimately contributing to a more compassionate and just world.

In conclusion, wisdom (*paññā*) is one of the three essential components of the Noble Eightfold Path. Wisdom is an important aspect of Buddhist practice because it enables individuals to see the true nature of reality and overcome the ignorance that causes suffering. While virtue (*sīla* or *guṇa-dhammma*) holds great significance in the spiritual journey of individuals, it provides a moral compass and ethical framework for practitioners, guiding their thoughts, speech, and actions. By cultivating virtue, individuals purify their minds, reduce suffering, and create the necessary conditions for spiritual growth. Moreover, the practice of virtue extends beyond the individual, contributing to the well-being of society and fostering a more compassionate and harmonious world.

Buddhism Integration for Sustainable Development

Sustainable development refers to a holistic approach to societal progress that seeks to meet the needs of the present generation without compromising the ability of future generations to meet their own needs. It recognizes the interdependence of environmental, social, and economic aspects, and aims to achieve a balance for long-term well-being.

Sustainable development enables us to realize dependent origination of things in the sense that the arisen certain problems caused by certain originations and affecting us can be sustainably solved. For instance, environmental degradation can have adverse social and economic consequences, while social inequality and economic instability can hinder environmental sustainability. Achieving sustainable development requires a comprehensive and integrated approach that addresses all three dimensions simultaneously, recognizing their interdependence and seeking solutions that promote harmony and balance among them.

Buddhism integration refers to the process of incorporating Buddhist wisdom and virtue into one's daily life, beliefs, or worldview. It often involves applying Buddhist teachings such as mindfulness or sometimes meditation techniques, compassion, non-violence, dependent origination, and so on, to promote holistic well-being, foster social harmony, and cultivate ecological awareness. Integration of Theravāda Buddhism with contemporary frameworks for sustainable development can provide a valuable approach to address the pressing environmental, social, and economic challenges of our time. Furthermore, family values, personal beliefs and governance aspects are reported to be crucial drivers of the decision to pursue contributions to sustainable development goals (Vu et al., 2023). Following are some proposals for integrating Theravāda Buddhism with sustainable development: Theravāda Buddhism emphasizes mindful consumption and contentment with simple living. By integrating Buddhist teachings on non-attachment and moderation, individuals can adopt sustainable consumption habits, reduce waste, and minimize their ecological footprint (Tu & Thien, 2019). This integration can be supported by campaigns promoting mindful consumption, eco-friendly practices, and sustainable lifestyles. According to Buddhist religious logic, the behavior of family firms could be changed from a self-interest market logic to a stewardship perspective of market logic such as enabling family business leaders to do good for others based on values and beliefs (Vu et al., 2023). As a practicing religion, Buddhism may well be able to provide insights on practicing models as a solution to sustain society, the environment, and businesses (Sharma et al., 2023).

Mindfulness and meditation play a crucial role in cultivating wisdom and self-awareness in various spiritual traditions, including Theravāda Buddhism. They provide powerful tools for individuals to deepen their understanding of themselves and the nature of reality, leading to transformative insights and personal growth. In Theravāda Buddhism, mindfulness and meditation are integral parts of the Eightfold Path, a path that not only addresses the cessation of suffering, the extinction of kamma and the attainment of liberation but also provides a comprehensive framework for achieving a balanced, healthy, and meaningful life according to Buddhist teachings (Aggadhammo et al., 2024; Bodhi, 2010). Therefore, mindfulness and meditation may well be the foundation for the cultivation of wisdom and self-awareness, essential elements in the journey towards enlightenment. Furthermore, in the Buddhist scriptures, the effect of meditation is happiness both physical and mental by helping calm the mind, quenching suffering and cleansing the mind (Anuro et al., 2019). Therefore, by cultivating mindfulness and meditation, individuals develop a deep understanding of their own minds, gain insights into the nature of reality, and cultivate qualities of wisdom, compassion, and inner peace.

Theravāda Buddhism's teachings on interconnectedness and impermanence provide a philosophical basis for environmental stewardship. By integrating Buddhist principles with environmental policies and initiatives, there can be greater emphasis on conservation, protection of biodiversity, sustainable resource management, and the promotion of renewable energy sources. Buddhist monastic communities can serve as role models by implementing sustainable practices in their daily lives.

Moreover, integrating Theravāda Buddhism's ethical principles into contemporary business practices can foster socially responsible and environmentally sustainable approaches. Buddhist teachings on honesty, compassion, and non-harm can guide businesses in promoting fair trade, sustainable supply chains, responsible investment, and corporate social responsibility. This integration can be facilitated through the development of ethical business guidelines inspired by Buddhist principles.

Therefore, Theravāda Buddhism's emphasis on compassion and social justice can be integrated into efforts to address inequality, poverty, and social exclusion (Glies & Yetunde, 2020). By incorporating Buddhist values into social welfare policies, development programs, and humanitarian initiatives, there can be a greater focus on addressing systemic injustice, promoting equitable access to education and healthcare, and supporting marginalized communities.

Integrating mindfulness practices into governance and decision-making processes can enhance ethical leadership and promote long-term sustainable outcomes (Rieckmann, 2017). By incorporating mindfulness training for policymakers, politicians, and civil servants, decision-making can become more conscious, compassionate, and attuned to the interconnectedness of social, economic, and environmental dimensions. Mindful governance can facilitate inclusive and participatory decision-making processes that prioritize the well-being of all stakeholders.

Integrating Theravāda Buddhism's teachings on mindfulness and ethical values into education systems can foster the development of socially and environmentally conscious individuals. Incorporating mindfulness training into school curricula and educational institutions can equip students with the tools to cultivate wisdom, compassion, and responsible citizenship. This integration can support the nurturing of future generations who are committed to sustainable development.

By integrating Theravāda Buddhism with contemporary frameworks for sustainable development, we can tap into the profound insights and practices of Buddhism to address the complex challenges of our time. This integration provides a holistic and values-based approach that promotes the well-being of individuals, society, and the natural world, fostering a more sustainable and compassionate future.

The Role of Wisdom and Virtue in Theravāda Buddhism

The importance of mindfulness and ethical decision-making in promoting sustainability and well-being cannot be overstated. These two pillars are essential for creating a harmonious and balanced relationship with ourselves, others, and the environment. Here is an exploration of their significance: Mindfulness cultivates present-moment awareness and non-judgmental observation of our thoughts, emotions, and actions. By being fully present, we become more attuned to the interconnectedness of all phenomena, including our relationship with the natural world (Germer et al., 2013). This heightened awareness allows us to recognize the impact of our choices and behaviors on the environment and others. Virtue (Germer et al., 2013): Ethical decision-making, guided by moral principles and values, is crucial for promoting sustainability and well-being. When we make choices aligned with ethical considerations, we contribute to the greater good and the flourishing of all beings. By combining mindfulness and ethical decision-making, we cultivate a deep understanding of the interconnectedness between our actions, sustainability, and well-being. Mindfulness provides the foundation for self-awareness, while ethical decision-making guides us to act in accordance with our values and the principles of compassion, non-harming, and sustainability. Together, they empower us to make choices that promote the flourishing of ourselves, others, and the natural world, leading to a more sustainable and harmonious future.

Outcomes of Buddhist Integration for Sustainable Development of Wisdom and Virtue in Theravāda Buddhism

The integration of Theravāda Buddhism into sustainable development efforts brings forth numerous benefits that promote holistic well-being, foster social harmony, and cultivate ecological awareness. Theravāda Buddhism emphasizes the cultivation of virtue (*sīla*), concentration (*samādhi*), and wisdom (*paññā*), leading to holistic well-being. By integrating Buddhist principles into sustainable development, individuals and communities can experience enhanced mental, emotional, and spiritual well-being. This integration promotes a balanced and harmonious approach to life, addressing not only material needs but also the deeper aspects of human existence.

First, the wisdom-integration aspect; Theravāda Buddhism emphasizes wisdom framework rooted in mindfulness and meditation practices to promote holistic well-being and to foster inner peace and resilience. Integrating these practices into sustainable development efforts equips individuals with tools to navigate challenges and setbacks with equanimity. This inner resilience enables individuals to face the complexities of sustainable development work with clarity, patience, and compassion (Schonert-Reichl & Roeser, 2016).

Second, the virtue-integration aspect; Theravāda Buddhism provides a strong ethical framework rooted in compassion (*karuṇā*), non-violence (*ahiṃsā*), and interdependence (*paticcasamuppāda*). Integrating this ethical foundation into sustainable development efforts ensures that the pursuit of sustainability aligns with principles of social justice, environmental stewardship, and the well-being of all beings. This integration fosters a values-driven approach to sustainable development, addressing the root causes of social and environmental issues. Theravāda Buddhism promotes social harmony by emphasizing empathy, compassion, and equality (Skilling, 2012). By combining these principles to enhance sustainable development efforts, communities can work together towards inclusive and equitable solutions. This combination fosters social cohesion, bridges divisions, and promotes participatory decision-making processes, ensuring that marginalized voices are heard and considered.

Theravāda Buddhism's teachings on interconnectedness and impermanence provide a strong foundation for ecological awareness and conservation. These teachings can be integrated with sustainable development efforts. Thus, an increased focus on environmental preservation, sustainable resource management, and ecological restoration can be obtained. The integration can cultivate a deep appreciation for the natural world and a sense of responsibility to protect and sustain it for future generations (Borchert, 2018). Figure 1 shows the outcomes of Buddhist integration for the sustainable development of wisdom and virtue.

From Figure 1, integrating Theravāda Buddhism into sustainable development efforts encourages individuals to become engaged citizens, actively participating in shaping sustainable and just societies. This integration fosters a sense of personal responsibility and empowerment, inspiring individuals to take action for positive change in their communities and the world. It encourages individuals to align their daily actions with their values and principles. Overall, the integration of Theravāda Buddhism into sustainable development efforts has the potential to promote holistic well-being, foster social harmony, and cultivate ecological awareness. By incorporating Buddhist principles into sustainable development frameworks, individuals and communities can work towards a more sustainable, equitable, and compassionate world. This integration offers a profound pathway to address the interconnected challenges of our time and cultivate a more harmonious relationship with ourselves, others, and the environment.

Conclusion

The integration of Buddhism into sustainable development efforts, specifically within the Theravāda tradition, holds immense potential for promoting wisdom, virtue, and sustainable well-being in the 21st century. By incorporating Buddhist principles and practices into contemporary frameworks, we can address the crucial challenges of our time in a holistic and transformative manner. Through the cultivation of wisdom, individuals can gain a deeper understanding of the interconnected nature of existence, leading to a greater appreciation for the environment and the imperative of sustainable living. The ethical principles of Buddhism, such as compassion, non-harming, and interdependence, can be the guidelines for decision-making processes that impact social justice, equity, and stewardship of resources.

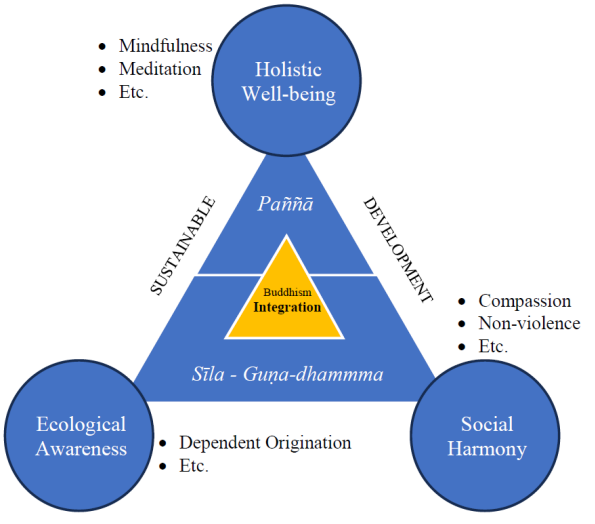

Figure 1 The outcomes of Buddhist integration for the sustainable development of wisdom and virtue

The integration of Buddhism and sustainable development effort offers numerous benefits, including the promotion of holistic well-being, both individually and collectively. By practicing mindfulness and meditation, individuals can cultivate inner peace, resilience, and self-awareness, leading to better mental and emotional stability as well as spiritual well-being. Social harmony is fostered through principles of empathy, compassion, and inclusivity, ensuring that sustainable development efforts prioritize the needs and voices of all communities. Moreover, the integration of Theravāda Buddhism into sustainable development promotes ecological awareness and conservation. By embracing the teachings of impermanence and interconnectedness, individuals are able to develop a deep sense of responsibility towards the environment, leading to sustainable practices and the preservation of natural resources for future generations.

In conclusion, the integration of Buddhism into sustainable development aligns timeless wisdom with contemporary challenges. By incorporating the principles and practices of Theravāda Buddhism, we can foster a more sustainable, compassionate, wise, and better life quality in the future. This integration offers a transformative pathway towards individual well-being, social harmony, and ecological stewardship, and also guides us in contributing a more harmonious relationship with ourselves, others, and the environment in the 21st century and beyond.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Crime scene management for drone incidents

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Abstract

Criminals could potentially exploit drones to perpetrate illicit activities as they have become increasingly accessible. This research aims to examine patterns of drone-related crime and develop guidelines for effective crime scene management in drone incidents for first responders. Qualitative research methods were employed to collect data, including document analysis, in-depth interviews with ten key informants from law enforcement and forensic divisions, and a focus group discussion with seven experts in policing and digital forensics.

The research findings revealed that the patterns of drone-related crime could be classified into five categories, including (1) personal rights violation, (2) violations of aviation laws and regulations, (3) contraband smuggling, (4) crimes against persons and terrorism, and (5) aerial reconnaissance to facilitate criminal acts. The crime scene management of drone incidents involves three main phases, namely, (1) incident notification and preparation, (2) crime scene approach and protection, and (3) evidence collection. Law enforcement officers should be aware of the key components of drones and the dangers at the incident scene, conduct appropriate evidence collection, and formulate accurate evidentiary inquiries for forensic examination. It is suggested that future research should further develop these findings into practical applications by creating a standardised manual for crime scene management for drone incidents in Thailand.

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Introduction

Drones, or unmanned aerial vehicles (UAVs), have transitioned from primarily military applications to widespread civilian and commercial use due to their increasing accessibility and affordability (Sayler, 2015). It is reported that the global drone market is expected to increase from USD 25.7 Billion in 2024 to USD 54.6 Billion by 2030 (Zanelli & Bödecker, 2024). Drones have been used across various industries, including aerial photography, delivery services, agriculture, construction, emergency response, and law enforcement

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such as police surveillance and crime scene investigation (Dolata & Schwabe, 2023; Valdovinos et al., 2016). However, the ongoing proliferation of drones presents significant challenges to public safety and security due to the potential for misuse in criminal activities.

Particularly, drones could be misused to facilitate criminal activities, such as drone assassination (Rogers & Kunertova, 2022), contraband smuggling (National Institute of Justice, 2023), stalking and privacy violations (Mercer, 2019; Wattanarung, 2019), and terrorist attacks (Army Recognition, 2024; Peck, 2023). In Thailand, authorities have recognised drone threats, evidenced by multiple incidents of drones detected operating near airports and restricted areas (Ngamkham, 2017). Notably, drones are suspected of being used for reconnaissance before insurgent attacks in the southern border region. For instance, an ambush involving gunfire and grenades occurred shortly after a suspicious drone was observed flying near a military base in Yala in 2023 (ThaiPBS, 2023). Another unauthorised flying drone was found later that year at Chana Police Station in Narathiwat (MGR Online, 2023).

Crime scenes involving drone incidents can be hazardous, especially when drones carry explosive or chemical payloads (Reiber, 2018). Such substances pose severe risks to first responders, such as police officers, crime scene investigators, and rescuers. Explosive devices risk detonation if mishandled, leading to catastrophic damage and loss of life. Chemical agents may be toxic, corrosive, or environmentally hazardous, posing health risks through inhalation, skin contact, or environmental contamination. Furthermore, an armed drone's presence exacerbates the dangers, as premature attempts to retrieve or disarm it could inadvertently trigger payload delivery. Even the multirotor propellers could pose laceration hazards if the drone unexpectedly takes flight (Duma et al., 2021). In addition to immediate threats from drones, the crime scene investigation of such incidents requires meticulous attention to detail, as drones can leave behind a variety of physical, digital, and biological evidence that must be carefully collected and analysed to reconstruct the events and identify the offenders.

Given these risks, developing specific protocols for crime scene management related to drone incidents are crucial, yet the Royal Thai Police currently lacks such guidelines. The lack of standardised procedures for handling drone-related crime scenes further complicates the situation, particularly in jurisdictions like Thailand, where such incidents are relatively new and under-regulated. Traditional crime scene management practices may be insufficient to address the specific challenges posed by drones, necessitating the development of specialised protocols that consider the unique characteristics of drone technology. These protocols must encompass all stages of crime scene management, from the initial response and hazard assessment to evidence collection, preservation, and analysis. Therefore, this paper aims to examine how drones could facilitate criminal offences and propose guidelines for first responders to ensure safe and effective crime scene management in drone incidents.

Literature Review

The primary legal framework for drone regulations in Thailand is outlined in the Air Navigation Act B.E. 2497 (1954) and the Announcement of the Ministry of Transport on Rules to Apply for Permission and Conditions to Control and Launch Unmanned Aircraft in the Category of Remotely Piloted Aircraft B.E. 2558 (2015). Briefly, all drones must be registered with the National Broadcasting Telecommunications Commission (NBTC) and Civil Aviation Authority of Thailand (CAAT) prior to the flight if they either have a camera or weigh two kilogrammes or more. During flight, it is prohibited to fly in a manner that endangers life, property, or peace, enter restricted areas, fly within nine kilometres of airports or over 90 metres high, violate privacy, carry dangerous items, or fly within 30 metres of people (The Civil Aviation Authority of Thailand [CAAT], 2022). Notably, Thailand has designated several no-fly zones where drone operations are strictly prohibited unless proper authorisation is obtained. These restricted areas include airports and their vicinity, military bases and installations, Royal Palaces and Government Houses, and especially the VTR1 area, marked by a 19-kilometre radius from the Victory Monument, encompassing Bangkok's central districts (CAAT, 2022). A study by Roolak (2017) particularly recognises a surge in unauthorised drone flights in restricted areas and violations of aviation laws in Thailand, which could pose severe threats to national security in both military and civilian contexts.

The literature review on drone-related criminal activities reveals a growing concern in the field of public security. Yaacoub et al. (2020) provide a comprehensive analysis of drones and their potential for misuse, categorising drone-related crimes into physical and logical attacks. Physical attacks encompass a range of activities from assassinations and privacy violations to drug smuggling and property damage, while logical attacks focus on cyber-attacks and

signal interference caused by drones. These physical attacks align with a study by Wattanarung (2019) that examines the legal measures against drone misuse, addressing privacy violations, invasion, assaults, and sexual harassment. Furthermore, Caldwell et al. (2020) highlight the emerging threat of AI-enabled autonomous drone swarms. Their research underscores the potential for these technologically advanced systems to conduct complex operations without human control, potentially causing more significant damage and posing greater challenges for law enforcement. The authors assess that the threat of drone swarms is highly likely and could directly endanger lives and property, such as assassinations or attacks on passenger aircraft.

In terms of crime scene management, the Royal Thai Police currently follows guidelines set by the National Forensic Science Technology Center [NFSTC] (2013). These guidelines outline a comprehensive crime scene investigation protocol that begins with establishing control over the area, ensuring scene safety, and separating potential witnesses. Investigators then methodically conduct an initial survey, noting priorities before implementing measures to preserve the untouched scene integrity and restrict evidence contamination. A systematic search visually records and documents all items of evidentiary value through detailed illustrations, photography, and videography. Physical evidence is meticulously collected, packaged, and its chain of custody initiated. After a final survey confirming thorough crime scene processing, the area is released to the owner. These protocols initially served as the theoretical framework for this research. Nevertheless, the researcher identified that these protocols involved an excessive number of steps, making it challenging to structure the research findings effectively. Consequently, the researcher adopted an alternative framework proposed by Gehl and Plecas (2017), which was originally developed for criminal investigation. This framework divides the criminal event into three main stages of time where evidence can originate: (1) the pre-crime stage, which includes planning, note-taking, research, and preparation of supplies; (2) the criminal event stage, which involves the transfer of physical evidence at the crime scene, the victim, and the suspect; and (3) the post-crime stage, which encompasses actions such as avoiding apprehension, discarding or cleaning up evidence, and dealing with the proceeds of the crime.

Building on this framework, the researcher developed a tailored theoretical framework for managing crime scenes involving drone incidents, structured into three primary phases: (1) the pre-crime scene approach phase, which involves incident notification and preparation, (2) the crime scene approach phase, which focuses on the approach to and protection of the crime scene; and (3) the post-crime scene approach phase, which is centred on the collection of evidence. This refined framework provides a more focused and applicable approach to managing the complexities of drone-related crime scenes.

Notably, the International Criminal Police Organization [INTERPOL] (2020) launched a framework for responding to a drone incident, focusing on officer safety and drone seizure with careful handling of evidence at the scene. It is mandatory to recognise that hazardous or explosive substances in the payload or even the drone's battery could cause injuries to first responders. Furthermore, the drone propellers could be dangerous if they are still rotating; therefore, a heavy sheet or net is recommended to cover the drone so as to prevent it from operating.

In terms of digital evidence, MacDermott et al. (2020) emphasise that crime scene investigators must understand the types of data drones store, including flight data, capabilities, geolocation, sensors, communication systems, and controllers, to properly handle forensic evidence in drone-related crime scenes. Additionally, Al-Room et al. (2021) explore the pieces of evidence gathered from the laboratory forensic examination of six brands of drones, including location history, GPS coordinates, flight paths, photo and video recordings, and data from drone controllers in both physical storage and cloud platforms. These findings provide a crucial framework for crime scene investigators, the primary stakeholders in this research, to understand and interpret evidence obtained from drone incidents.

Methodology

Data Collection

This research employed qualitative research methods to collect data as follows:

1. Documentary analysis was conducted by reviewing legal statutes, Supreme Court judgments, news, articles, theses, research papers, and online media related to the use of drones to commit or facilitate a crime both from domestic and international contexts. The analysis mainly focused on patterns of crime associated with drones and forming proper questions for in-depth interviews.

2. In-depth interviews were performed with ten key informants from various organisations dealing with drone-related issues and digital forensics, including the Defence Technology Institute, Bangkok Metropolitan Police Bureau, Drone Operations and Anti-Drone Task Force (Royal Thai Police), Crime Scene Investigation Division and Digital Forensics Division (Office of Police Forensic Science), Central Institute of Forensic Science, Navaminda Kasatriyadhiraj Royal Air Force Academy, and Civil Aviation Authority of Thailand. The interviews aimed at gathering their perspectives on drone-related crime trends and crime scene management for drone incidents.

3. After in-depth interviews, a focus group discussion was then conducted to brainstorm ideas and opinions to refine research results and guidelines for crime scene management for drone incidents. The participants included seven experts from the fields of law enforcement, drone technology in policing, crime scene management, and digital forensics. The experts were from the Royal Police Cadet Academy, Digital Forensics Division (Office of Police Forensic Science), Bangkok Metropolitan Police Bureau, and Drone and Anti-Drone Task Force (Royal Thai Police).

In terms of in-depth interviews and the focus group discussion, a semi-structured interview and discussion guide was developed as a tool to collect data. Prior to data collection, the research tool was reviewed and approved by advisers and the Institutional Review Board of the Faculty of Forensic Science, Royal Police Cadet Academy (FSRPCA-IRB-65033). A set of open-ended questions was employed to allow participants to give details about drone-related crime and trends in Thailand including patterns of crime scene that first responders might encounter. Furthermore, they were asked to provide a comprehensive approach for crime scene management, including crucial steps to safely enter the scene and appropriately collect forensic evidence for criminal investigation.

Data Analysis

The data gathered from in-depth interviews and the focus group discussion were recorded, transcribed, and sent back to the participants for accuracy and validity in accordance with the member checking technique. Furthermore, data triangulation was applied to enhance confidence in research results by comparing data from the interviews, focus group discussion, and extended document analysis. Thematic analysis was then employed to categorise themes and patterns of research findings.

Results and Discussion

Patterns of Drone-Related Crime

While there are no official statistical reports on illegal drone activities in Thailand, the researcher attempted to gather information by sending letters to all police regions. The responses indicated that no data or records on drone criminal activities are available. However, some key informants in this research acknowledged the occurrence of numerous drone incidents, particularly those intended to inflict physical harm on others, but they expressed a desire to keep these incidents confidential to prevent potential copycat crimes. Despite this lack of information in Thailand, a document review indicates that the threat posed by drones is escalating. For instance, DroneSec, a drone intelligence firm, reported a significant increase in the number of drone-related incidents, with 2,554 major illicit drone incidents recorded in 2022 alone—an increase of 60 percent from 2021 (Unmanned Airspace, 2023). This includes a 140 percent rise in residential incidents, a 130 percent rise in incidents at event spaces or areas of interest, a 100 percent increase in incidents involving government and critical infrastructure, a 50 percent increase in border incidents, and a 40 percent rise in prison deliveries. These incidents mostly involve drones being used to transport weapons, narcotics, and contraband across borders or into restricted areas, as well as drones infringing on the airspace of manned aircraft or violating no-fly zones such as hospitals and airports.

In a similar vein, a 2023 report from the UK estimates that over 6,000 drone incidents were reported to the police, with approximately 31 percent involving drones suspected of delivering contraband to prisons, 13 percent involving drones flying in flight-restricted zones and causing significant financial losses in aviation, and numerous reports of drones being used for privacy violations or operating recklessly, potentially causing accidents (Jackman & Hooper, 2023). It is clear that the trend of drone incidents is on the rise, and the findings from document research provided a foundation for the data analysis in this study in terms of drone-related crime patterns. Consequently, the research findings revealed five distinct patterns of drone-related crime (Table 1).

Table 1 Patterns of drone-related crime

Offence	Impact / Harm	Patterns
Personal rights violation	- Deprivation of rights - Invasion - Sexual harassment	- Aerial invasion - Voyeurism - Stalking - Non-consensual production of pornography
Violations of aviation laws and regulations	- Abuse of national security - Impact on aviation industry - Loss of life and property (in case of collision)	- Unauthorised use of drones in the prohibited, restricted, and danger zones - Flying in airport zones - Altitude limit violation
Contraband smuggling	- Disturbing peace and order of the penitentiary - Breach of border security	- Contraband smuggling into prisons by drone deliveries - Drug smuggling across borders by drone deliveries
Crimes against persons and terrorism	- Loss of life - Injuries - Public fear and panic	- Drone assassination - Carrying bombs or hazardous materials - Drone accidents - Hoax terrorism
Aerial reconnaissance to facilitate criminal acts	- Crimes against person and property - Terrorist attacks - Other types of drone-related crime	- Drone spying - Aerial reconnaissance for criminal or terrorist purposes - Using drone to facilitate theft or robbery

Personal Rights Violations

Drone technology has enabled new forms of personal rights violations, particularly in the realm of privacy. Drones equipped with cameras can invade personal spaces, capturing images and video without consent. This intrusive form of voyeurism and surveillance allows perpetrators to illegally monitor an individual's movements and activities from a distance. A key informant mentioned an instance where a private detective used drones to illegally stalk victims and report their activities to employers. This invasion of privacy can escalate to sexual harassment when drones are used to record compromising situations or produce non-consensual sexually explicit material. These findings are consistent with the privacy issues and sexual offences highlighted in previous literature (Mercer, 2019; Wattanarung, 2019).

Violations of Aviation Laws and Regulations

Drones pose severe threats through violations of aviation laws and regulations, ranging from compromising national security to disrupting aviation operations. Unauthorised drone flights in prohibited, restricted, and danger zones, as well as intrusions into airport airspace, not only breach airspace regulations but also raise significant safety concerns. The findings revealed numerous cases of drones flying in the VTR1 restricted area, resulting in criminal liability and fines. The majority of key informants indicated that these violations often stemmed from operators' lack of awareness and knowledge about aviation laws, regulations, and the locations of danger, prohibited, and restricted areas. Altitude limit violations further exacerbate these risks, increasing the chances of collisions with manned aircraft, which could lead to catastrophic loss of life and property. For instance, an Emirates Airlines Airbus A380-800 allegedly collided with a drone while landing in France in August 2023, resulting in substantial damage to the nose gear and wing (Tolba, 2023). This incident aligns with the concerns raised by Roolak (2017) regarding drone-related violations of aviation laws and regulations.

Contraband Smuggling

Drones are increasingly used for contraband smuggling, presenting challenges for law enforcement and security agencies in Thailand. One prominent pattern involves the delivery of contraband into prisons, where drones are employed to drop items such as mobile phones, weapons, and drugs directly into prison yards, consistent with previous research (Yaacoub et al., 2020). This not only disrupts the peace and order of penitentiaries but also complicates inmate behaviour management and prison security. However, most key informants reported that no contraband deliveries to prisons were successful due to anti-drone systems.

Nevertheless, they warned that officers should remain vigilant, as drones are becoming increasingly quiet, potentially leading to successful deliveries in the future. Another concerning pattern is the use of drones for drug smuggling across Thailand's borders. The key informants revealed that criminal networks in Thailand and neighbouring countries exploit drones' capability to carry substantial payloads over long distances for narcotics transportation.

Crimes Against Persons and Terrorism

Drones have become a concerning tool for perpetrating crimes against persons and acts of terrorism. Drone assassinations now pose a real threat, potentially allowing perpetrators to carry out attacks from a safe distance. An example is the attempted assassination of the Venezuelan President in 2018, using a couple of small drones equipped with explosives (Rosati & Bronner, 2018). Drones carrying hazardous materials also pose significant risks to public spaces and critical infrastructure, enabling terrorists to deliver destructive payloads with precision and minimal risk to themselves. While there have been no reported intentional drone attacks for assassination and physical harm in Thailand according to public reports or news, two key informants revealed that such cases have occurred. However, they could not provide more information as these incidents remain classified.

Drone accidents, while not always intentional, can result in severe injuries when these devices malfunction or are operated recklessly in populated areas. The velocity of drones makes them capable of inflicting significant physical harm. Moreover, the rotors can act as blades, potentially lacerating skin or tissue upon impact. For example, a drone accident at a 5K race in Quebec resulted in a runner being struck in the head by a falling photography drone, causing a whiplash injury (Rosenblatt, 2016). Key informants noted that drone accidents could prove fatal if the damage occurs to crucial areas of the victim's body, such as the head or neck, or if the victim is an infant or young child.

In addition to direct attacks, drones can be employed for hoax terrorism, where harmless devices create fear and disruption. This tactic is exploited by those seeking to cause panic without the immediate risk of violence. A key informant cited an incident where a suspicious drone was found in front of a hotel during a summit conference in Bangkok. While initially feared to be a bomb, no explosives were present. Police officers believed the drone was intentionally used to create panic. This incident bears similarities to an event in Tokyo in 2015, where a drone with traces of radiation was discovered on the roof of the official residence of the Japanese Prime Minister (The Guardian, 2015). Both cases illustrate how drones can be used to instil fear and disrupt public events, even when posing no immediate physical threat.

Aerial Reconnaissance to Facilitate Criminal Acts

Using drones for aerial reconnaissance to facilitate criminal acts is a significant pattern in drone-related crime. This pattern manifests in various forms, including drone spying for intelligence gathering in contraband and drug smuggling operations, aerial surveillance to plan terrorist attacks, as seen in Thailand's southern border provinces (ThaiPBS, 2023; MGR Online, 2023), and facilitating theft and robbery, exemplified by an ATM robbery in France (Singh, 2022). Notably, the key informants emphasised the use of drones for aerial surveillance in terrorism. They reported that terrorist attacks in Thailand often occurred after a drone was observed flying near the intended target. In some instances, a more sinister tactic was employed: a drone equipped with explosives would be deliberately placed to lure officers to inspect it, while another bomb was concealed along the route to the drone. This secondary device was intended to detonate when security personnel approached, potentially causing significant casualties.

Crime Scene Management

The findings revealed that crime scene management for drone incidents involving criminal activities encompass three main phases in accordance with the theoretical framework, including (1) incident notification and preparation, (2) crime scene approach and protection, and (3) evidence collection. Details are illustrated in Figure 1 as follows:

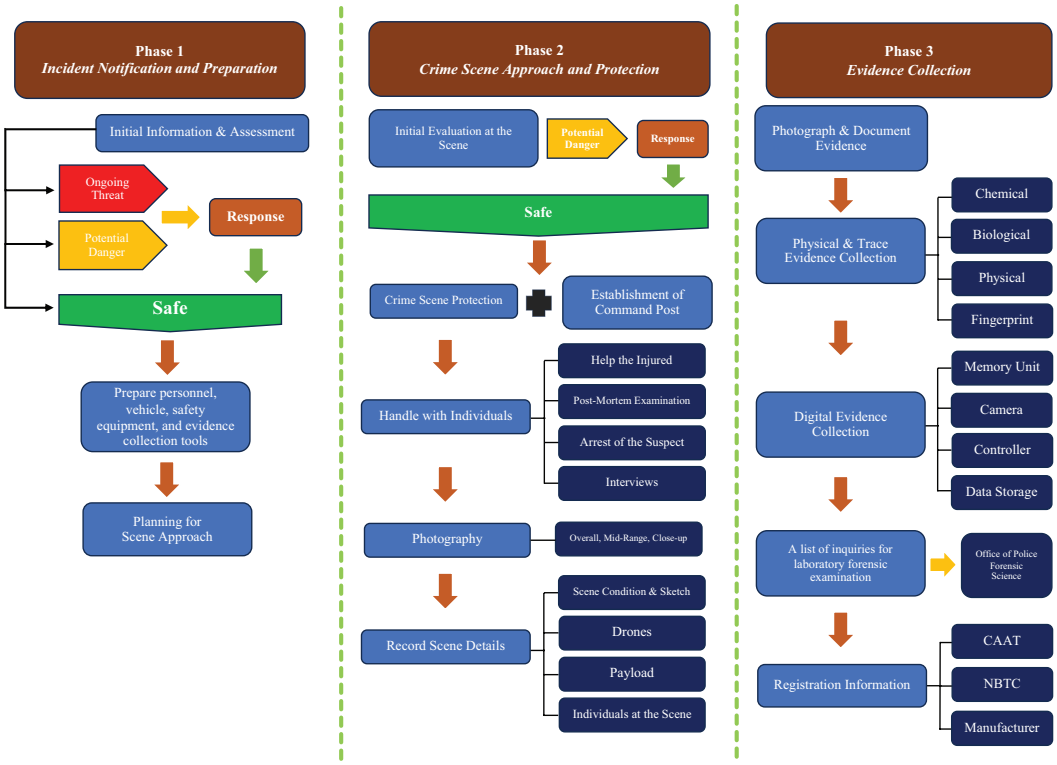

Figure 1 Proposed crime scene management guidelines

Phase 1: Incident Notification and Preparation

Before entering the scene, crime scene investigators are tasked with gathering detailed information about the incident from the dispatcher, including time, location and drone characteristics. They must assess the drone's status, determining whether it is airborne, crashed or stationary, and record relevant details such as casualties and injuries. Situational awareness is crucial, with officers evaluating the safety of the incident site. Based on the initial information, a preliminary evaluation is conducted to hypothesise about the type of crime involved, guiding subsequent investigation strategies. Throughout the process, officer safety remains a top priority, especially in potentially hazardous situations. The scene must be completely secure before approaching. This is consistent with the guidelines provided by INTERPOL (2020). If there are ongoing threats or potential dangers at the scene, investigators are required to wait until first responders have fully cleared the area and declared it safe.

The protocol emphasises the importance of preparedness and planning, ensuring that personnel are equipped with necessary vehicles, safety equipment, and evidence collection tools and set a plan to identify, search, and collect evidence before approaching the scene. Additional tools in this research, apart from the crime scene toolkit recommended by the NFSTC (2013), include binoculars, high-zoom cameras, or drones equipped with thermal imaging camera for initial site assessment. Moreover, radio and phone signal jammers (specifically for 2.4 GHz and 5.8 GHz frequencies commonly used by commercial drones) are suggested for crime scene investigators to cut the communication system between the drone and controller. Canvas, netting, or metal sheets are recommended to protect officers from potential harm caused by functioning drones at the scene, whether from their rotors or potential crashes, consistent with previous research mentioning this type of harm by drone (INTERPOL, 2020; Duma et al., 2021). Meanwhile, Faraday bags may be required if the mobile phone controlling the drone is expected to be found at the scene.

Phase 2: Crime Scene Approach and Protection

The process begins with an initial assessment upon approaching the scene to confirm safety, based on details from Phase 1. Most key informants recommended the use of signal jammers to disrupt drone-controller communication.

Additionally, the employment of remote assessment tools such as binoculars, high-zoom cameras, or thermal imaging drones is advised for maximum safety, if possible. If the drone is found fallen or stationary at the scene, covering it with canvas, netting, or metal sheets is recommended to prevent potential harm if it is suspected to be active or operational.

Crime scene protection involves establishing a three-tiered cordoned area to safeguard the crime scene. The innermost area is reserved for investigators, a middle tier for the command post, and an outer area for media and local residents. This setup aligns with the scene control guidelines established by the NFSTC (2013). Particular attention is given to the careful management of individuals at the scene, prioritising assistance for the injured while maintaining the integrity of evidence. Meanwhile, handling suspects found at or near the scene involves the immediate separation of potential perpetrators from control devices that may contain crucial evidence, such as controllers or mobile phones. Preliminary interviews should be conducted with victims, witnesses, and suspects at the scene.

Throughout the process, meticulous documentation is stressed, including recording arrival times, environmental conditions, and detailed observations of the scene and the drone itself, such as type, make, model, and serial number. Forensic photography principles should be applied, capturing images from overall, mid-range, close-up, and close-up with scale (INTERPOL, 2020). Additionally, a scene sketch is required for further use in the courtroom.

Phase 3: Evidence Collection

This phase involves the systematic recording and collection of evidence to ensure that all relevant information is captured and preserved for investigative and legal purposes. The head of the investigation team plays a crucial role in describing the crime scene, identifying potential hazards, defining objectives, and assigning specific tasks to team members. They also outline the methods for searching and collecting evidence to ensure thoroughness and accuracy (NFSTC, 2013).

Consistent with INTERPOL (2020) guidelines, key informants recommended that physical and trace evidence be collected first, as such could be destroyed or contaminated by weather conditions or other factors. For instance, DNA and fingerprints should be collected from the drone's legs or propellers. Handling the drone at the crime scene requires extreme caution, even when confirmed to be completely inactive. The procedure includes carefully disassembling and collecting components such as the battery, camera, external memory, and SIM cards.

Key informants noted that most drones are powered by lithium-ion batteries, which are susceptible to water. Investigators must be aware of the potential hazards, such as battery leakage or overheating that could lead to explosions. If the drone controller is seized, all data must be safeguarded against potential data loss or remote wiping. For example, a mobile phone used as a controller must be put in flight mode and collected in a Faraday bag to preserve crucial data for the investigation, including flight logs, flight paths, location history, pictures, and videos captured from the drone. All these are important evidence, as highlighted in a study by MacDermott et al. (2020). Additionally, any payloads such as drugs, explosives, or other contraband need to be documented and sampled carefully, considering their specific characteristics and potential dangers.

After leaving the scene, investigators should ensure that all evidence and details are comprehensively gathered. They should then provide a list of inquiries for laboratory examination, based on the offence and information required from the evidence, and send it with the evidence to the Office of Police Forensic Science. Furthermore, registration information should be requested from the National Broadcasting and Telecommunications Commission (NBTC) and the Civil Aviation Authority of Thailand (CAAT), which are the regulators in Thailand, for the identification of the drone owner or operator. The manufacturer company should also be contacted to collect registration details and the purchase and aftersales service history of the drone owner or operator.

Conclusion and Recommendation

The accessibility of drones has opened new avenues for criminals to engage in illicit activities. This research has examined patterns of drone-related crime and proposed guidelines for crime scene management in drone incidents specifically for first responders and crime scene investigators. Utilising qualitative research methods, including document analysis, in-depth interviews, and a focus group discussion, this study has identified five categories of drone-related crime: (1) personal rights violations, (2) violations of aviation laws and regulations, (3) contraband smuggling, (4) crimes against persons and terrorism, and (5) aerial reconnaissance to facilitate criminal acts.

Effective crime scene management for drone incidents involves three primary phases: (1) incident notification and preparation, (2) crime scene approach and protection, and (3) evidence collection. Before proceeding to the scene, crime scene investigators must thoroughly gather detailed information about the incident and ensure both themselves and their equipment are fully prepared. When approaching the scene, law enforcement officers must remain highly vigilant of drone components and potential dangers, while also preventing uninvolved bystanders from contaminating the area. Once at the crime scene, crime scene investigators must ensure thorough evidence collection, with particular attention to the vulnerability of digital evidence, handling it with care, and formulating precise inquiries for laboratory forensic examination.

It is recommended that the Royal Thai Police should prioritise training and educating police officers on responding to incidents, accidents, or cases involving drones. This includes establishing protocols for countering drones and managing crime scenes where drones are found. Furthermore, policymakers should mandate that companies manufacturing drones and electronic components with branches, offices, or dealers in Thailand must register and create a database for the buying and selling of electronic parts used in the production or assembly of unmanned aerial systems. This will facilitate the tracking of ownership of such electronic components, similar to the registration of SIM cards and mobile phone numbers, especially when self-assembled drones are found at crime scenes. The NBTC and CAAT should be authorised to create and inspect such a database and link it with the Royal Thai Police's database to enable direct search and verification through the police information system.

Future research should focus on translating these findings into practical applications, including the development of a standardised manual for crime scene management of drone incidents in Thailand. Such a manual would provide law enforcement with a consistent framework to effectively address and mitigate the unique challenges posed by drone-related crimes. Additionally, it is important to raise public awareness of drone-related threats and appropriate response measures, as the first person to witness an incident may not be a law enforcement officer but an ordinary citizen. Meanwhile, the public should be well educated on how to operate drones legally to prevent potential threats.

Conflict of Interest

The author declares that there is no conflict of interest.

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Alternative justice: Exploring community justice solutions for juvenile offenders in Thailand

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Abstract

This paper examines the role and effectiveness of Community Justice Centers and Damrongdhama Centers in addressing juvenile delinquency within Thailand's justice system. Through qualitative research, including interviews with community justice professionals, it explores how restorative practices align with the Rehabilitation Theory of juvenile cases. The study emphasizes the importance of community justice in offering alternatives to formal legal processes, stressing early intervention, conflict resolution, and community integration to support the rehabilitation of juvenile offenders. While highlighting the strengths of community justice initiatives in diverting juveniles from the traditional formal system and promoting law-abiding communities, it also addresses challenges such as resource constraints and limited public awareness. The paper discusses theoretical foundations such as rehabilitation theory, diversion, and community empowerment, offering insights into their role in mitigating juvenile delinquency. It calls for legal and policy reforms, including a dedicated framework for community justice, clear criteria for application, prioritization of community justice in eligible juvenile cases, and increased public awareness and trust. This research advocates for a comprehensive approach to juvenile justice that prioritizes equity, efficiency, and compassion. It emphasizes the need for a responsive justice system tailored to juvenile needs, promoting reforms that create a supportive community environment for the rehabilitation and reintegration of young offenders.

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Introduction

There are certain criminal cases that may not necessarily fall under criminal justice. These instances are called community-based justice or community justice, where parties can mutually agree to resolve disputes without resorting to formal court proceedings. Specifically, in cases involving child and juvenile criminal acts, a different approach is taken compared to the traditional justice process, which usually focuses on retribution, deterrence, and incapacitation of the wrongdoer. Instead, the emphasis is placed on rehabilitation and providing opportunities for juvenile offenders to reform and reintegrate into society.

The legal framework establishes criteria for applying alternative measures instead of criminal proceedings. These measures can be implemented at various stages of the legal process, including prior to the prosecution under Article 86 of the Juvenile and Family Court and Procedure Act B.E. 2553 (2010), during the adjudication of cases under Article 90, and prior to having a verdict under Article 132. Thus, applying legal statutes in the Juvenile and Family Court and Procedure Act B.E. 2553 (2010) becomes crucial through the employment of rehabilitation and recovery plans, with the most importance placed on the victim's consent. Furthermore, community involvement in developing such plans is essential, with community representatives participating to benefit the offenders by not being socially rejected and enabling them to reintegrate into society successfully. Additionally, community involvement fosters acceptance of wrongdoers within society. It contributes to community safety, executed through the authority of the probation and court systems, operating within the broader framework of the main justice system. However, that may impose burdens on a system of main criminal justice that already handles a significant caseload, as well as involve lengthy processes that may slow down the victim's recovery and potentially result in the rejection of the wrongdoer by the community until they can prove themselves. It may also have implications for community safety. Therefore, mediating or resolving disputes through community-based justice, known as community justice, such as Justice Provincial Offices, Community Justice, Damrongdhama Centers, or Dispute Resolution Centers in schools, can solve various issues because it is a method initiated by community members and does not require much time. If the victim consents and is satisfied, the parties can effectively mediate and adjudicate the matter within the community without resorting to the formal justice system. Thus, this research aims to explore the appropriateness of the law and the relevant agencies involved in the community justice process to provide recommendations for enhancing its effectiveness.

Literature Review

Community justice refers to measures or strategies aimed at reducing and preventing criminal behavior through the involvement and active participation of the community. It opens opportunities for community engagement, creates spaces for restorative practices as an alternative approach to accessing justice, and promotes societal safety and community resilience (Chaiyapong et al., 2012). Community justice focuses on building strong partnerships within and between organizations with shared responsibility for public safety, fostering close relationships between communities and their members, compensating victims for the harm caused by offenses, transforming offender behavior, and promoting community safety through collaborative efforts between the community justice system and each community (Buaphuean, 2006, p. 53). There are several related concepts and theories underpinning the idea of community justice as follows:

1. Rehabilitative Theory: This theory aims to rehabilitate offenders, fostering self-awareness, inhibiting repeated offenses, and facilitating the reintegration of offenders into society. It involves providing sufficient training, vocational education, and education to support offenders in leading productive lives (Limprasert et al., 2019, p. 1491–1492), helping to stigmatize the offenders.

2. Community Empowerment and Participation: This concept assumes that when community members actively prevent crime and rebuild good relationships among their neighbors, it directly reduces crime and the fear of crime. The idea emphasizes community involvement, collaboration between the government and the community in a partnership model and understanding the public and agencies' roles in the community justice process (Kurki, 2000, p. 235–303). Additionally, it is a concept that places importance on public participation, collaboration between the government and people, and understanding the roles of people and agencies in a justice process that encourages people in the community to participate in partnership or community ownership which will create a driving force for collective surveillance and prevention of crime and create responsibility for the community (Limprasert et al., 2019, p. 1470). This leads to further cooperation between people in

the community and the government sector through providing understanding, encouragement, support for crime victims and communities to return to everyday life, including help applying for assistance from government agencies

3. Social Bonding Theory: According to Travis Hirschi, this theory emphasizes the importance of social bonds among individuals or groups. When community members feel bonded to one another and their community, they are less likely to create conflicts and increase social cohesion. In such communities, problems decrease to be infrequent (Limprasert et al., 2019, p. 1470–1471).

4. Responsibilities and Transfer of Government Responsibilities: This perspective advocates transferring the responsibility for handling criminal issues from the central government to local communities. This approach promotes cooperation and community involvement with various organizations established within the community. It encourages the community to play a significant role in new organizations that emerge (Aeoamnuay, 2020, p. 25). This concept aligns with the strategy to reduce cases entering the mainstream justice process, wherein community justice includes victims, offenders, family members, community members, and committees, such as the juveniles committee, alternative community justice committee, and neighborhood committee (Tanrungsang, 2010, p. 58). It becomes an essential approach that diminishes the state's role, increases community involvement, and serves as an alternative community justice process to divert cases and reduce the number of cases entering the conventional justice system (Jaihan, 2011, p. 41).

5. Reintegration: Reintegrating offenders into the community aims to enable individuals to lead a normal life without returning to criminal behavior.

The fundamental principles and theories of community justice align with handling cases and practices concerning children and juveniles. Both dimensions of victims and offenders are considered, given that the approach to criminal cases involving minors and juveniles differs from those involving adults. In the case of adult offenders, the law focuses on punishment, revenge, compensation, and exclusion from society. However, in the case of minors and juveniles, the law emphasizes safeguarding their dignity, protecting their future, and seeking measures that prioritize their best interests. Doing so includes utilizing social support or various alternatives instead of traditional punitive processes to administer justice. Moreover, non-formal methods, criteria, or practices may be employed, as well as implementing methods beyond court processes to support the consideration of cases involving children and juveniles (Trijudjaganya, 2018, p. 71).

Thailand has established a working model between the state and the community that emphasizes fairness and security. Currently, the responsible agencies for the operation of the community justice system in Thailand include Community Justice Centers and Damrongdhama Centers.

Community Justice Center

A Community Justice Center (CJC) is a facility established within Local Administrative Organizations (LAO). It serves as the workplace for the Community Justice Committee or performs various tasks of the community under five missions, including 1) preventing and controlling crimes in the community, 2) receiving complaints and reports, 3) managing conflicts, 4) providing support and empowerment to crime victims and community members, and 5) reintegrating good citizens into society. The staff of the Community Justice Center will be involved in various tasks related to service provision, such as receiving and mediating complaints, establishing the justice fund, and providing financial assistance to victims and detainees in criminal cases (Community Justice Centers, Phra Nakhon Si Ayutthaya, 2020, p. 4).

Regarding the role of work concerning children and juveniles in the dimension of reintegration into society, there are juvenile centers, and protection centers or training centers for juveniles who have been released or those who have undertaken the extraordinary measures to replace criminal prosecution in accordance with Article 86 of the Juvenile and Family Court and Procedure Act B.E. 2553 (2010). During the preparation stage before release, there will be target of children and juveniles, raising awareness, and developing individual follow-up plans in coordination with the network. Moreover, there will be a mechanism for monitoring, care, and assistance at the local level through the coverage of the Community Justice Center in each sub-district. After the release, there will be follow-ups, care, and summarization to find ways for further assistance, analysis of follow-up strategies, or future prevention (Community Justice Centers, Phra Nakhon Si Ayutthaya, 2020, p. 10).

Damrongdhama Center

The Damrongdhama Center has been established with various missions, including receiving complaints and reports, providing information and consultation services, accepting suggestions and feedback from the public, coordinating and mediating conflicts, and resolving community issues. The Ministry of Interior is responsible

for overseeing and facilitating the services provided by the Damrongdhama Center, which are divided into two levels: the Central Damrongdhama Center, under the Ministry of Interior, and the Damrongdhama Center, which provides the same service as provided by the Central Damrongdhama Center, Ministry of Interior. For the enterprises in the division or public enterprise, the regional Dhamrongdhama Center is divided into two levels, which are the provincial Dhamrongdhama Center and the District Dhamrongdhama Center (Inspection and Grievances & Ministry of Interior, 2023).

However, since the Damrongdhama Center operates under the Ministry of Interior, its scope and responsibilities are broad and do not specifically focus on issues related to juveniles. This situation limits the ability of the Damrongdhama Center to address matters concerning juveniles directly.

Community Justice Systems for Juveniles in Different Countries

Community justice system for juveniles in Canada

Canada has a community justice system as an alternative measure before proceeding to the formal criminal justice process. It focuses on diversion, a step before entering the regular process. There are two forms of diversion (Engler & Crowe, 2000, p. 2): police discretion and alternative measures.

1. Police Discretion: The police are not allowed to lay charges as an informal measure to avoid formal criminal proceedings. For instance, in cases where it is a juvenile's first offense or a minor offense, the police can ask juveniles to apologize to the victims, or the police may bring them back home to consult with their parents. Alternatively, the police can refer the case to community agencies for voluntary work in Canada. Giving police discretion not to proceed with criminal charges is a significant and legally accepted mechanism within the community (Crown Prosecution Service Guideline, 2014).

2. Alternative Measures: These measures are recognized under section 717 of the Canadian Criminal Code. The measures grant victims the option to choose alternative measures, and local prosecutors have the authority to consider whether a case is appropriate for alternative measures in the community justice system (Trevethan & MacKillop, 1997). Some provinces may involve senior police officers appointed by the Attorney General's Office to consider alternative measures (Crown Prosecution Service Guideline, 2014). In the process of alternative measures, consent from all parties involved is necessary. Once deemed appropriate, a specific form of alternative measures is determined. Examples include victim-offender mediation (VOM) and family group conferencing (FGC). After the completion of the alternative measures process, an agreement or contract specifying the agreed-upon terms and actions is signed by all involved parties. If the agreement is not fulfilled, the case may be returned to the local prosecutor or representative to consider further action. Once the measures are completed, the case is considered closed and there will be no criminal record, avoiding the need for court proceedings.

Community justice system for juveniles in Scotland

Scotland has a community justice system for juveniles referred to as the Whole System Approach (WSA), which covers the process, from identifying the needs and circumstances of the children or youth involved in the offense to the court proceedings (Government of Scotland, n.d.). The community justice system in Scotland is governed by the Community Justice (Scotland) Act 2016, which defines the principles and relevant terms (Community Justice (Scotland) Act 2016, Sections 1 and 2. The community justice process for juveniles in Scotland comprises effective early intervention, diversion in the community, and community-based alternatives to secure care and custody (Government of Scotland, n.d.):

1. Effective Early Intervention: When an offense occurs, and a young person is involved, effective early intervention aims to prevent further offending behavior and reduce violence or anti-social behavior. Police officers in the community can carry out early intervention measures that are flexible for young offenders. The appropriate proportion and duration of these measures should be considered, and relevant community agencies may be involved in collaboratively addressing the young person's offenses.

2. Diversion of Young People from Prosecution: Diversion is beneficial compared to custodial measures. It allows young people who commit minor offenses to avoid formal court proceedings. Within the community, diversion can occur through the discretion of local prosecutors, who can decide not to prosecute and offer young people community-based rehabilitation activities. Collaboration among various community agencies in Scotland is essential for implementing these diversion measures.

3. Community Alternatives to Secure Care and Custody: Scotland emphasizes the fundamental principles in developing these measures, which involve three essential components: service provider, workers and decision-makers.

Methodology

In this documentary research, the study focuses on relevant regulations, textbooks, legal documents, and theses. It also collects data using in-depth interviews with real practitioners, including provincial justice officials, community justice center officials, and the Damrongtham Center officials in Bangkok and Kanchanaburi, Thailand.

Participants

For the participant selection process, key informants were chosen deliberately to guarantee a thorough comprehension of how community justice is implemented for juvenile delinquency within Thailand. Patton (2014) emphasizes the significance of purposive sampling in enabling researchers to identify "information-rich cases" which provide a detailed understanding of the subject matter. The criteria for selecting participants focus on individuals possessing a minimum of five years of experience in fields related to juvenile justice, assuring that the perspectives provided are well-informed and reflective of the developments and application of community justice practices in Thailand.

Results

The findings from in-depth interviews with individuals working in organizations related to community justice reveal insightful details on the practices impacting the application of restorative practices in child and juvenile criminal acts. The interview questions delved into the beneficial aspects, strengths, considerations, and the focus on problem-solving before involving investigators.

Community Justice

The role of community justice in addressing juvenile criminal acts presents a multifaceted approach that leverages local resources, legal expertise, and community engagement to foster a supportive environment for child and youth rehabilitation and conflict resolution. The expanded analysis delves deeper into the strengths, challenges, and factors contributing to the success of community justice systems, emphasizing their potential to transform juvenile justice practices.

Strengths of Community Justice

1. Proactive Conflict Resolution: The foundational mission of Community Justice Centers is to mediate community disputes, which places them at the forefront of preventative justice. This orientation towards conflict resolution before escalation aligns perfectly with reducing juvenile delinquency through early intervention, highlighting the centers' role in fostering a peaceful community environment.

2. Strategic Accessibility and Integration: The strategic placement of these centers within crucial community and educational institutions enhances their accessibility, making it easier for juveniles and their families to seek help. This integration into the fabric of community and school life ensures that the centers are seen as approachable resources, facilitating a more proactive approach to dispute resolution and legal education.

3. Empowered Community Representatives: Utilizing community-based personnel deeply integrated within the local context ensures that mediation processes are grounded in the community's values and norms. These individuals, with their respected positions and understanding of regional dynamics, are ideally positioned to mediate disputes effectively and culturally sensitively.

4. Comprehensive Community Engagement: The emphasis on legal education and preventive measures undertaken by Community Justice Centers plays a pivotal role in resolving disputes and educating the community about legal rights and responsibilities. This holistic approach helps build a more informed and law-abiding society, reducing the likelihood of future offenses.

Challenges in Diverting Juvenile Criminal Acts

1. Diluted Focus Due to Delegated Responsibilities: When the responsibility of case handling is spread across agencies for which it is not a primary duty, the specialized attention required for effective mediation may be diluted. This dispersion of focus can hinder the centers' ability to provide the targeted support needed for juvenile cases.

2. Barrier of Limited Legal Expertise: The scarcity of legal experts within the centers could limit their ability to address more complex juvenile cases that require specialized legal knowledge. Strengthening the legal expertise available within these centers is essential for ensuring that all cases are handled with the appropriate level of legal acumen.

3. Financial Limitations Impacting Effectiveness: The challenge of limited budget allocations restricts the centers' operational capacity, affecting both their preventative initiatives and their ability to respond effectively to cases. Enhanced funding would support a more robust infrastructure for dispute resolution and community education efforts.

4. Lack of Public Awareness and Trust: Lack of awareness among the public about the centers' roles and benefits influences the effectiveness of community justice. This gap in understanding can affect the utilization of these services and the overall trust in the mediation process.

5. Influence and Bias Concerns: Concerns about the influence of community leaders and potential biases they may bring into the mediation process can undermine the perceived fairness and trustworthiness of the centers. Ensuring impartiality and transparency in mediation is crucial for maintaining the integrity of the process.

Factors Contributing to Success:

1. Creation of Specialized Units: Developing units focused explicitly on restorative practices for juveniles can significantly enhance the effectiveness of dispute resolution. These specialized units, concentrating on restorative justice, can provide tailored solutions that address the unique needs of juveniles involved in disputes.

2. Continuity with Respected Personnel: The appointment of dedicated personnel who are stable and respected within the community is vital for building long-term trust and ensuring consistent application of restorative practices. This stability helps address issues of community influence and ensures that individuals with a deep understanding of local contexts conduct mediation.

3. Commitment to Adequate Funding: Ensuring sufficient financial resources are allocated to Community Justice Centers is critical to enabling a comprehensive approach to dispute resolution and preventative education. Adequate funding supports the sustainability of these centers and their capacity to make a tangible impact on reducing juvenile delinquency.

4. Enhanced Promotion and Community Integration: Promoting Community Justice Centers and making them more accessible through modern communication channels like hotlines, websites, and apps can significantly increase their visibility and use. This increased awareness, coupled with convenient access, encourages greater community engagement with the centers, leveraging their full potential to serve as pillars of support for juveniles and their families.

Through an expanded understanding of these dynamics, it becomes evident that while community justice faces significant challenges, its strengths and the key factors contributing to its success offer a promising pathway for addressing juvenile delinquency. Strengthening these aspects can further empower Community Justice Centers to serve as effective platforms for promoting restorative practices and fostering a more supportive environment for child and youth in conflict with the law.

Damrongdhama Center

The Damrongdhama Center, with its legal mandate from the National Peace and Order Announcement No. 96/2557, is a pivotal entity in Thailand's community justice landscape, especially in addressing child and juvenile criminal acts. Insights from interviews reveal a nuanced understanding of the Center's strengths, challenges, and factors contributing to its success in applying community justice practices. An expanded analysis of these aspects provides a deeper dive into the operational dynamics and the impact of the Damrongdhama Center.

Strengths of Damrongdhama Center

1. Legal Authority and Mandate: The Damrongdhama Center is empowered by national legislation to mediate and resolve disputes, including those involving juveniles. This legal backbone legitimizes its operations and ensures compliance and recognition from all stakeholders involved in community justice processes.

2. Nationwide Presence: With its widespread network across provinces, districts, and local administrative organizations, the Center boasts an expansive reach that ensures its services are accessible across a broad spectrum of the population. This geographic dispersion is crucial for the timely and efficient handling of disputes at the grassroots level.

3. Qualified Personnel: The presence of qualified professionals, including lawyers, within the Center underscores its capability to offer sound legal advice and mediation. This expertise is instrumental in navigating the complexities of child and juvenile criminal acts, ensuring that resolutions are effective and legally sound.

4. Public Relations and User Base: The Damrongdhama Center has cultivated a large user base through extensive public relations efforts, reflecting trust and reliance on its services. This broad engagement indicates the Center's success in public outreach and its role as a trusted mediator in community disputes.

Challenges Faced by Damrongdhama Center

1. Limited Reach for Certain Cases: The Center often sees fewer complaints about juvenile acts due to the prevalence of primary community justice processes. Minor offenses may be mediated through school organizations, with the Damrongdhama Center stepping in only when cases stall, highlighting a potential gap in early intervention.

2. Diverse Responsibilities: The broad spectrum of responsibilities shouldered by the Center, from legal advice to assistance in various areas, may dilute its focus on community justice roles. This multiplicity of tasks risks overshadowing its primary function in mediating and resolving disputes, possibly affecting its efficacy in specific community justice endeavors.

Factors Contributing to Success

1. Community Cohesion: The strength of community ties, particularly pronounced in rural areas, fosters a conducive environment for the Damrongdhama Center's mediation efforts. This local cohesion and trust in community members as mediators enhance the acceptability and effectiveness of the Center's interventions.

2. Expertise and Credibility of Personnel: The Center's success is significantly bolstered by its cadre of knowledgeable and credible personnel. Legal experts within the Center are pivotal in advising and facilitating mediation, contributing to a high success rate in dispute resolution.

In summary, the Damrongdhama Center plays a critical role in the community justice system in Thailand, particularly in dealing with juvenile criminal acts. While it boasts significant strengths, including legal authority and qualified personnel, it also faces challenges such as limited reach in some instances and the potential dilution of its community justice focus due to diverse responsibilities. Nonetheless, factors like solid community cohesion and the expertise of its personnel are vital contributors to its success. Addressing these challenges and leveraging its strengths can further enhance the Damrongdhama Center's effectiveness as a model for community justice application.

Discussion

Alignment with Rehabilitation Theory

The study's insights into proactive conflict resolution and comprehensive community engagement initiatives of Community Justice Centers underscore their alignment with the Rehabilitation Theory. This theory advocates for rehabilitation and societal reintegration, focusing on transforming offenders into productive citizens (Phaibunpohnphitak, 2012). The Community Justice Center's mission-driven approach to mediating disputes mirrors the state's role in protecting juveniles' futures and facilitating their rehabilitation, adhering to the principles of safeguarding dignity and prioritizing the best interests of minors (Phaibunpohnphitak, 2012).

Efficacy of Diversion in Criminal Cases

Diversionary practices, particularly for juveniles, are strongly supported by the study's findings, highlighting the significance of early intervention and the strategic accessibility of Community Justice Centers. This approach aligns with the diversion objectives, aiming to rehabilitate rather than punish juveniles, thereby avoiding the adverse effects of formal judicial processes (Phaibunpohnphitak, 2012). The challenges faced by Damrongdhama Centers in reaching certain juvenile cases further emphasize the importance of community-based approaches for effective diversion, facilitating restorative outcomes, and preventing the stigmatization of juveniles.

Importance of Community Empowerment and Participation

The study's findings on the role of community-based personnel and local resources in Community Justice Centers underscore the importance of community empowerment and participation. This approach aligns with the concept that active community engagement directly contributes to crime reduction and supports a nurturing environment for juveniles (Limprasert et al., 2019). It suggests that empowered communities are crucial in addressing juvenile criminal acts through effective mediation and conflict resolution.

Challenges and Implications for Policy and Practice

The identified challenges, including diluted focus, limited legal expertise, financial constraints, and low public awareness, underscore the need for improvements in policy and practice (Community Justice Centers, Phra Nakhon Si Ayutthaya, 2020). Enhancing funding, increasing public education about community justice roles, and ensuring qualified personnel availability are crucial to maximizing community justice effectiveness in diverting juvenile cases and promoting rehabilitation (Inspection and Grievances & Ministry of Interior, n.d.).

Theoretical and Practical Contributions

This research bridges empirical findings with theoretical frameworks, offering insights into the practical application of community justice in addressing juvenile delinquency. The operation and impact of community justice and the Damrongdhama Centers provide a model for other jurisdictions, emphasizing the importance of rehabilitation, diversion, and community empowerment in the justice process for juveniles (Chaiyapong et al., 2012; Limprasert et al., 2019).

Conclusion and Recommendation

This study highlights the pivotal role of Community Justice Centers in mediating and resolving disputes involving juveniles, emphasizing a proactive approach to conflict resolution and the benefits of integrating these centers within the community fabric. The alignment of Community Justice practices with the Rehabilitation Theory underscores the importance of prioritizing the rehabilitation and reintegration of juvenile offenders into society, away from punitive measures. The findings indicate that such an approach supports the individual development of juveniles and contributes to the broader goal of fostering a law-abiding and cohesive community. The effectiveness of diversionary practices highlighted by this research demonstrates the significant potential of Community Justice Centers to provide juveniles with a constructive alternative to the formal justice system, steering them toward pathways of rehabilitation and reconciliation. However, the challenges identified—such as resource constraints, the necessity for heightened public awareness, and better legal expertise—point towards areas requiring policy enhancement and community education to bolster the efficacy of community justice initiatives.

Furthermore, the Damrongdhama Centers, endowed with a legal mandate and a widespread presence, emerge as a crucial component of Thailand's community justice landscape. Despite the challenges posed by their broad scope of responsibilities and their limited direct engagement with cases involving children and juveniles, these centers play a foundational role in the community justice system, offering essential mediation and support services that complement the endeavors of Community Justice Centers.

However, from the study, the researcher concluded that Community Justice Centers are more appropriate than the Damrongdhama Centers. They provide an alternative justice process involving mutual agreements between the parties and incorporating community participation because the juveniles will return to that community. Therefore, it is necessary to be accepted by the community as well. However, the Damrongdhama Centers usually focus on conflict resolution between the parties and more community participation. Through the lens of theoretical frameworks like the Rehabilitation Theory, diversion, and community empowerment, coupled with the empirical findings of this study, a nuanced understanding of the complexities and potentials of community justice in mitigating juvenile delinquency has been developed. These theoretical insights highlight the criticality of community involvement and restorative practices, advocating for a justice system attuned to juveniles' unique needs and circumstances. Thus, the study culminates in a call for comprehensive legal and policy reforms to enhance the effectiveness of community justice in Thailand. It advocates for creating a specific legal framework for community justice, clear criteria for its application, and the establishment of specialized agencies staffed by trained personnel dedicated to juvenile cases. There is also a pressing need for policies that amplify public awareness, cultivate community trust, and ensure supportive guidance from state officials. By weaving together these recommendations, Thai lawmakers should create specific legislation to empower Community Justice Centers. This legislation should define the scope and conditions, including the procedures prior to and after the justice process, and clear legal consequences to use effectively. The study proposes a holistic approach that resonates with the principles of restorative justice and envisions a more just, efficient, and empathetic resolution of juvenile offenses. This approach is poised to significantly contribute to fostering a supportive and understanding community environment conducive to the rehabilitation and reintegration of young offenders, marking a pivotal step towards a more compassionate and cohesive society.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Risk assessment of rubber plantations based on non-compliance with the FSC forest management certification standard

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Abstract

The Forest Stewardship Council (FSC) certifies products from rubber plantations in Thailand for export worldwide. Therefore, access to FSC Forest Management (FM) certification is essential, as it influences the social, economic, and environmental sustainability of Thailand's rubber plantations. This study assessed the risk of rubber plantations due to non-compliance with the FSC-FM certification standard. The methodology involved four steps: collecting secondary data on rubber planting patterns relative to FSC-FM standard, determining initial risks using content analysis and brainstorming, conducting field risk assessments through in-depth interviews, FSC standard implementation checks, and a forest resource survey, and analyzing data to determine risk levels due to non-compliance using content analysis. Twenty-four rubber plantations were classified into four categories: rubber monocultures, rubber intercropping with wood-based plants, rubber intercropping with non-wood-based plants, and rubber intercropping with both wood and non-wood-based plants. The risk assessment revealed that most plantations were at very low risk (136 indicators), followed by high risk, moderate risk, and low risk (36, 20, and 19 indicators). High-risk factors were primarily associated with compliance with the law. The study suggests that risks related to each indicator should be addressed, and management strategies developed to mitigate these risks before seeking FSC-FM certification. The results of this research are beneficial to plantation managers, organization that promotes rubber plantations, and policymakers, who can use the findings to address the identified risks. They emphasize the development of management strategies and adherence to FSC principles to mitigate risks and improve compliance for expanded FSC certification for rubber plantations.

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Introduction

Thailand is the natural rubber world's largest producer and exporter (Department of International Trade Promotion, 2022). Thus, the rubber trees are one of the most important economic crops in Thailand that generate income and employ around one million families or up to six million people (Kongmanee et al., 2020) but also pose environmental challenges. Rubber plantations, if not managed sustainably, can lead to deforestation, loss of biodiversity, and soil degradation. The Forest Stewardship Council (FSC) certification promotes sustainable forest management practices globally. If forests are FSC certified, it confirms that forest products meet environmental, social and economic standards. This mechanism has had an impact on the industry and commerce that use wood and tree products as a production base as wood product importers may only prefer importing certified products (Duangsathaporn et al., 2019). Kuijk et al. (2009) provided a nuanced analysis, indicating that while FSC certification generally leads to improved management practices, the degree of compliance can vary significantly between different types of plantations. Natural forest operations often show higher compliance levels with FSC standards compared to monoculture plantations, which tend to struggle more with meeting biodiversity and social criteria. Forests vary from place to place, and management practices differ accordingly. Furthermore, the European Union (EU) has issued Deforestation-free products Regulation (EUDR), which the exporters of seven agriculture products must follow to be able to export products to the EU. They must adhere to these regulations to ensure that their products did not contribute to deforestation. The EUDR will have an impact on a range of Thai agriculture exports, in particular rubber and its derivatives, which are high-value Thai agriculture exports to the EU (European Union, 2023; Ministry of Foreign Affairs, 2023). If the rubber plantation can pass the FSC Forest Management (FSC-FM) standards, it will serve as a confirmation that at no point during the production was deforestation involved, in accordance with EUDR.

Despite the importance of FSC certification, many rubber plantations in Thailand face challenges in meeting the FSC standards. This is due to the lack of compliance and its implications for both the environment and the economy. A literature review found that forest management is certified by FSC, and there are only 19 certificates for rubber plantations in Thailand (Forest Stewardship Council [FSC], 2021), with only 0.6 percent of the total area under rubber plantation that have obtained an FSC-FM. Most of rubber plantations are under monoculture cultivation. Currently, given the crisis due to low rubber price, policies have been made to promote and support small landholders to use their land efficiently by having more biodiversity through intercropping rubber with other agricultural activities in the plantation. This would also increase the revenue and limit the use of resources (land) to maximize benefits. Thus, the rubber plantations in Thailand exhibit a great variety of types compared to plantations of other species. In the future, it is expected that the number of plantations involving the use of intercropping with rubber will increase.

A procedural method is employed during the formulation of new National Forest Stewardship Standards (NFSS) through the FSC for each country. This method involves either transitioning from an existing NFSS to Principles and Criteria Version 5-2 (P&C V5-2), or retrospectively integrating it into an approved NFSS. The objective of this procedural method is to outline steps for implementing a risk-based approach within NFSS, which involves evaluating, identifying, and addressing risks based on the likelihood and impact of non-conformity with NFSS indicators (FSC, 2018d). Currently, Thailand is waiting for the enforcement of FSC standard.

This research aims to assess the risk of rubber plantations under non-compliance with the FSC-FM standard in Thailand by classifying the rubber plantation types in Thailand, analyzing the risks in each rubber plantation type, and presenting guidelines to make recommendations for appropriate risk reduction. The outcomes of this study are used to evaluate the status of forest management certification of rubber plantations in order to improve rubber plantations in Thailand to be certified according to FSC-FM standards by using risk as a criterion. Moreover, the results of this research are beneficial to policymakers, organization that promotes rubber plantations, plantation managers, and the broader community, who can use the result to address the identified risks. They emphasize the development of management strategies and adherence to FSC principles to mitigate risks and improve compliance for expanded FSC certified rubber plantations.

Methodology

The methodology used in this study consisted of four steps: (1) collection of secondary data; (2) analysis of the primary risk associated with rubber plantations that are unable to meet the FSC-FM certification standard; (3) field risk assessment of rubber plantations that are non-compliant with respect to the FSC-FM certification standard; and (4) analysis of the data to determine the risk of non-compliant rubber plantations (Figure 1). These steps are described further below.

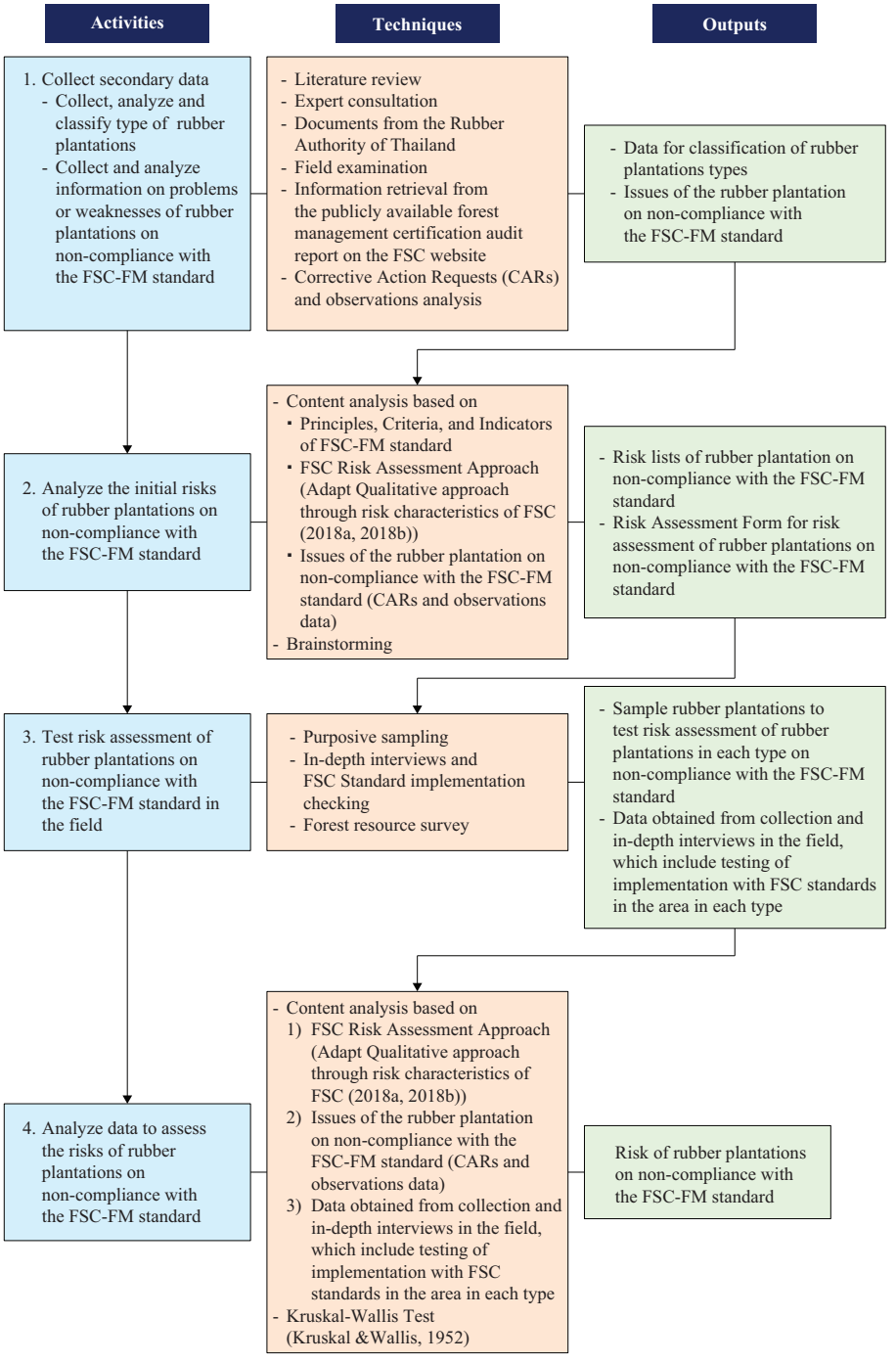

Figure 1 Schematic diagram of the study methodology, involving four steps (activities)

Secondary Data Collection

The data collection from the study sites in Thailand that were used for field risk assessment of non-compliant rubber plantations with the FSC-FM standard were divided into three categories. These included in-depth interviews with: (1) the leaders of Ban Na Prang Pattana Farmers Group in Ban Na Prang Pattana, Khlong Kwang Subdistrict, Na Thawi District, Songkhla Province, who had obtained an FSC group certification for a Small and Low-Intensity Managed Forest (SLIMF) type; (2) key persons of the Thai Rubber Land and Plantation Co., Ltd. who had obtained an individual FSC certification or a Single Management Unit which was located in Ang Thong Subdistrict, Chiang Kham District, Phayao Province; and (3) rubber plantations owners of each type.

In total, there were 24 sample rubber plantations (6 plantations for each type): in Songkhla province, southern Thailand (12 plantations), and in Rayong province, eastern Thailand (12 plantations). These rubber plantations were categorized and sorted according to the FSC-FM standard. Data from three sources were utilized: literature reviews, consultations with experts at the Rubber Research Institute which controls the management of rubber plantations, and documentation from the Rubber Authority of Thailand, that manages the country's rubber system (Rubber Authority of Thailand, 2020). Information on various planting styles and consultation with experts was used to classify the rubber plantation types. As a result, the rubber plantations were classified into four types using purposive sampling (Black, 2010):

1. Type A: a monoculture of only rubber trees in the area.

2. Type B: rubber trees with plants that are planted for wood yield at the end of rotation, such as teak or iron wood.

3. Type C: rubber trees along with plants that are planted to take advantage of parts other than wood such as fruits, leaves, roots, tubers, pods or seeds.

4. Type D: rubber intercropping with wood-based and non-wood based plants.

For the FSC-FM standard, data were collected to cover 10 principles, 70 criteria, and 211 indicators using document reference codes; FSC-STD-01-001 V5-2 EN and FSC-STD-60-004 V2-0 EN (FSC, 2015; FSC, 2018a).

Corrective Action Requests (CARs) analysis is used to assess the risk information of rubber plantations based on non-compliance with the FSC-FM certification standard. Each CARs identifies the nature of the problem and classifies the issues according to FSC principles, criteria, and indicators to further consider the level of risk.

Data related to the FSC-FM certification of the rubber plantations in Thailand were collected from publicly available audit reports on the FSC website (https://info.fsc.org/certificate.php) during the years 2011–2019. These reports included valid, suspended, and terminated certificates states, totaling 61 public reports. Various types of audits, such as initial audits, main audits, surveillance audits, and complementary audits, were conducted on 16 certifications of rubber plantations. The collected data were analyzed to identify CARs, observations, evidence, and close-out evidence of non-conformities. Major CARs were 76 times covering 38 issues, minor CARs were found 199 times covering 58 issues, and observations were 2 times covering 2 issues. Based on these data, problems related to non-compliance of rubber plantations with the FSC certification standard were identified and grouped by non-categorizing them according to principles, criteria, and indicators. A total of 68 issues were identified from 211 indicators based on the FSC-FM standard (FSC, 2015; FSC, 2018a).

The rubber plantations not complying with the FSC-FM standard were grouped based on 211 indicators. This qualitative approach utilized the risk characteristics outlined in the FSC-FM standard and the risk-based approach recommended by the FSC. The Guidelines for Standard Developers provides techniques to include a risk-based approach into the National Forest Stewardship Standards, which divides risks into four levels: very low risk, low risk, moderate risk, and high risk. The categorization of various indicators into these risk levels were done according to the FSC guidelines (FSC, 2018c; FSC, 2018d), with each level determined based on the risk characteristics.

Analysis of the Initial Risks of Rubber Plantations on Non-Compliance with the FSC-FM Standard

We analyzed the initial risk using content analysis (Krippendorff, 2004) and brainstorming with five experts who have experience in forest management, FSC-FM certification process and are part of the team that drafts Thailand's FSC-FM standards. Experts jointly considered the risks in each indicator using data that consisted of (1) principles, criteria, and indicators of the FSC-FM standard; (2) FSC risk assessment through adapt qualitative approach based on risk characteristics of FSC (FSC, 2018c; FSC, 2018d),

in which the risk was divided into four levels; and (3) challenges related to adherence of rubber plantations to the FSC-FM standard, while accounting for CARs, observations, Non-Conformities, and close-out evidence. Using these points, we developed a risk assessment form to evaluate the compliance of rubber plantations to the FSC-FM standard. This form was constructed from the risk lists based on 211 indicators and initial risk designations for each indicator.

Field Testing of Risk Assessment Due to Non-Compliance of Rubber Plantations with the FSC-FM Standard

Risk assessments due to non-compliance of the rubber plantations with the FSC-FM certification standard used the risk assessment form tailored to the specific characteristics of each type of rubber plantation in Thailand. Data collection methods included in-depth interviews to identify practical challenges faced by plantation managers and activities that plantation managers perform. The key topics covered in the interviews included management practices, compliance with the law, workers' rights and employment conditions, community relations, benefits from the forest, environmental values and impacts, management planning, monitoring and assessment and High Conservation Values (HCV). Next, FSC standard implementation checks were done to evaluate on-the-ground implementation of FSC-FM standards, and forest resource surveys of the status of resources such as physical and biological resources were conducted with the leader of the Ban Na Prang Pattana Farmers Group, two key individuals from the Thai Rubber Land and Plantation Co., Ltd., and 24 sample rubber plantation owners and their respective plantations. All information obtained was used to assess and mitigate the initial risks of rubber plantations not complying with the FSC-FM standard.

Data Analysis to Determine the Non-Compliance Risk of Rubber Plantations with the FSC-FM Standard

The non-compliance risk of rubber plantations with the FSC-FM standard was assessed through a qualitative analysis. Content analysis (Krippendorff, 2004) was used for data from three sources of information. Firstly, the FSC risk assessment approach was adapted through a qualitative approach based on the FSC risk characteristics. Risk characteristics descriptions that served to classify indicators into categories of high risk, moderate risk, low risk, and very low risk were (FSC, 2018c; FSC, 2018d):

High risk: risk characteristics associated with high risk indicators includes the value represented by the indicator is known to be affected by forest management, the value represented by the indicator is of considerable social significance, the value represented by the indicator causes stakeholder concern or is considered a national priority, the value represented by the indicator is the subject of legal proceedings, the value represented by the indicator is declining in abundance/prevalence, little is known about the value represented by the indicator, there is a history of poor management of the value represented by the indicator, there is a history of contention regarding the value's status represented by the indicator, or the value represented by the indicator is a challenge for forest management in the national context.

Moderate risk: Risk characteristics associated with moderate risk indicators includes an important social, ecological or economic value represented by the indicator.

Low risk: Risk characteristics associated with low risk indicators includes low likelihood that the value represented by the indicator occurs in the forest, the value represented by the indicator is addressed well by regulatory instruments, the value represented by the indicator is common and not affected by forest management, negative effects carry little repercussion, there is low concern to stakeholders, or the value represented by the indicator is common practice for foresters.

Very low risk: List of risk characteristics associated with very low risk indicators includes very low likelihood of occurrence, and well evaluated and controlled by regulatory authorities, and no incidents of negative impact on the value represented by the indicator by forest management have been reported in the country within the last 5 years (either through a CARs issued by a certification body in an FSC audit, or through a formal complaint by a stakeholder), and there is demonstrated key stakeholder support across all chambers.

These criteria were used to consider CARs data and data from the field on each issue to improve the initial level of risk. Secondly, issues related to the non-compliance of rubber plantations in Thailand with the FSC-FM standard were identified through an analysis of CARs and observations. Lastly, data obtained from field collection and in-depth interviews, which also included testing of implementation of FSC standards in the area, were considered. Content analysis was used to categorize risks within each indicator for each type of rubber plantation. The research data analysis used nonparametric statistic, called the Kruskal-Wallis test

(Kruskal and Wallis, 1952), for more than two groups to compare risk levels across different rubber plantation types in Thailand (significance was tested at $p < .05$). SPSS software was applied for data analysis.

Using the three sources of information, experts can apply content analysis and brainstorming to summarize qualitative data and determine the risks for each indicator across different types of rubber plantations. Thus, the results of this research are significant for improving plantation management practices and informed policy recommendations.

Results and Discussion

Risk of Non-Compliance of Rubber Plantations with the FSC-FM Standard

Analysis based on the requirements of the FSC-FM standard, which includes 10 principles, 70 criteria, and 211 indicators, indicated varying levels of risk. The highest number of indicators were classified as very low risk with 136 indicators, followed by high risk with 36 (17.06%) indicators, moderate risk with 20 (9.48%) indicators, and low risk with 19 (9.00%) indicators. Figures 2 and Table 1 illustrate the distribution of indicators by risk level across the different principles.

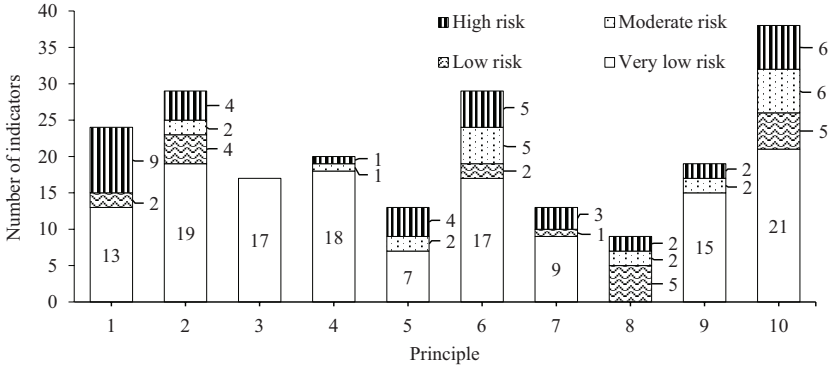

Figure 2 Number of indicators found at each risk level related to non-compliance of rubber plantations with the FSC-FM certification standards in Thailand, classified according to 10 principles

Table 1 Non-compliance risk of rubber plantations with the FSC-FM standard in Thailand for each principle, criteria, and indicator

Risk level			
Very low risk	Low risk	Moderate risk	High risk
1.1.1, 1.1.2, 1.3.3, 1.4.1, 1.4.2, 1.6.2, 1.6.4, 1.7.1, 1.7.2, 1.7.3, 1.7.4, 1.7.5, 1.8.2	1.2.2,1.6.1	-	1.2.1, 1.2.3, 1.3.1, 1.3.2, 1.4.3, 1.5.1, 1.5.2, 1.6.3, 1.8.1
2.1.2, 2.1.3, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.8, 2.2.9, 2.3.5, 2.4.1, 2.4.2, 2.4.3, 2.4.4, 2.6.1, 2.6.2, 2.6.3, 2.6.4	2.2.7, 2.3.4, 2.5.1, 2.5.2	2.1.4, 2.3.6	2.1.1, 2.3.1, 2.3.2, 2.3.3
3.1.1, 3.1.2, 3.2.1, 3.2.2, 3.2.3, 3.2.4, 3.2.5, 3.3.1, 3.3.2, 3.3.3, 3.4.1, 3.4.2, 3.5.1, 3.5.2, 3.5.3, 3.6.1, 3.6.2	-	-	-
4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.2.5, 4.3.1, 4.4.1, 4.4.2, 4.6.1, 4.6.2, 4.6.3, 4.6.4, 4.7.1, 4.7.2, 4.7.3, 4.8.1, 4.8.2	-	4.1.1	4.5.1
5.1.1, 5.1.2, 5.1.3, 5.3.1, 5.3.2, 5.4.1, 5.4.2	-	5.5.1, 5.5.2	5.2.1, 5.2.2, 5.2.3, 5.2.4
6.1.1, 6.2.1, 6.3.2, 6.4.2, 6.4.3, 6.4.4, 6.5.2, 6.6.1, 6.6.2, 6.6.3, 6.6.4, 6.7.2, 6.7.3, 6.7.4, 6.8.2, 6.9.1, 6.10.1	6.3.3, 6.8.1	6.1.2, 6.2.2, 6.3.1, 6.5.1, 6.7.1	6.4.1, 6.5.3, 6.5.4, 6.5.5, 6.10.2
7.1.1, 7.1.2, 7.1.3, 7.3.1, 7.5.2, 7.6.1, 7.6.2, 7.6.3, 7.6.4	7.5.1	-	7.2.1, 7.2.2, 7.4.1
-	8.1.1, 8.3.1, 8.4.1, 8.5.2, 8.5.3	8.2.1, 8.2.2	8.3.2, 8.5.1
9.1.2, 9.2.1, 9.2.2, 9.2.4, 9.2.5, 9.2.6, 9.2.7, 9.3.1, 9.3.2, 9.3.3, 9.3.4, 9.3.5, 9.4.2, 9.4.3, 9.4.4	-	9.1.3, 9.2.3	9.1.1, 9.4.1
10.2.1, 10.2.2, 10.3.1, 10.3.2, 10.3.4, 10.4.1, 10.5.1, 10.6.2, 10.6.4, 10.6.5, 10.7.6, 10.7.7, 10.8.4, 10.9.1, 10.9.2, 10.9.3, 10.10.1, 10.10.2, 10.10.3, 10.11.2, 10.11.3	10.6.3, 10.7.3, 10.8.1, 10.8.3, 10.9.4	10.3.3, 10.6.1, 10.7.5, 10.8.2, 10.11.1, 10.12.1	10.1.1, 10.1.2, 10.7.1, 10.7.2, 10.7.4, 10.11.4

Principle 1, which focuses on compliance with the law, was the most frequent high-risk principle. Principle 10, relating to the implementation of management activities, was identified as the second most common high-risk principle. Principle 6, concerning environmental values and impacts, ranked third in terms of high-risk prevalence. Principles 2 and 5 that address workers' rights and employment conditions, and benefits from the forest, respectively, were the joint fourth most frequent high-risk principles. Principle 7, pertaining to management planning, was the fifth most common high-risk principle. Principles 8 and 9, covering monitoring and assessment and HCV, respectively, were also identified as high-risk principles. Principle 4, related to community relations, was the least frequently encountered high-risk principle.

Principle 1 is the most common high-risk principle, which involves legal challenges that are difficult to solve. Addressing these problems will likely require a significant amount of time because it involves many agencies, and compliance with the law has many steps. Problems found in each indicator include indicator 1.2.1: the absence of documentation indicating land tenure and use rights in compliance with the law, resulting in a high level of concern from stakeholders, indicator 1.2.3: the boundaries of plantation are not clearly defined, both boundary markers in the area and shown on maps. This lack of clarity affects various activities within the plantation. Additionally, land boundaries are also related to legal requirements. Indicator 1.3.1: there are activities that do not comply with the applicable laws, regulations and administrative requirements, legal and customary rights, and obligatory codes of practice. Indicator 1.3.2: delays in payment of legally prescribed charges related to forest management, indicator 1.4.3 Illegal or unauthorized activities are detected, measures are not implemented to address them. Indicator 1.5.1 no compliance with applicable national laws, local laws, ratified international conventions and obligatory codes of practice relating to the transportation and trade of forest products up to the point of first sale is demonstrated. Indicator 1.5.2 No compliance with Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) provisions, including through possession of certificates for harvest and trade in any CITES species. From indicator 1.3.1 to 1.5.2, these five areas are of high risk because they are subject of legal proceedings. Indicator 1.6.3 no Up-to-date records of disputes related to issues of applicable laws or customary law, are held including: steps, outcomes of all dispute resolution processes, and unresolved disputes, the reasons they are not resolved, and how they will be resolved. This indicator is high risk due to considerable cultural or social significance and high level of concern from stakeholders. Last issue, indicator 1.8.1: no long-term commitment to forest management practices consistent with FSC principles and criteria and related policies and standards (for example, there was a change in the type of plant being grown while applying for certification). This is an important issue which shows a lack of compliance with FSC policy.

The indicators listed under high risk, as mentioned above, are all related to past instances of poor management, resulting in non-compliance with FSC-FM certification standards. These issues have had widespread ramifications within the forest plantation, necessitating the need for an immediate attention and resolution. However, addressing these problems would likely require a significant amount of time, particularly given the associated legal matters and FSC policies and standards. Despite the considerable concern expressed by stakeholders, little action has been taken to address these indicators. Nevertheless, it is important to promptly tackle these issues, as their potential to adversely affect other essential activities is high.

In addition, the high-risk issues found in other principles are listed in Table 1, for example, inadequate health and safety practices that fail to meet established standards. Moreover, deficiencies exist in ensuring workers' access to appropriate personal protective equipment (PPE), and in the implementation of measures to identify, avoid, and mitigate significant negative impacts of management activities on the local communities and environment. Failure to revise and update management plans periodically and the absence of data indicating sustainable harvest levels are additional concerns. When monitoring indicates non-conformities with the FSC Standard, the lack of subsequent revisions to management objectives, verifiable targets, and/or activities worsens the issue. Furthermore, there exists a shortfall in the allocation of Representative Sample Areas within the conservation areas network, constituting less than 10 percent of the total area under a management unit. Lastly, non-compliance with FSC's policy regarding the use and storage of chemical pesticides within a management unit further emphasizes the need for an immediate action.

The indicators categorized under moderate risk underline issues stemming from past non-compliance with Thailand's FSC-FM certification standards. Such problems can be promptly addressed without requiring extensive resolution time but necessitate

collective action involving the various stakeholders. They rely on data analysis for mitigation, and failure to address them will have adverse consequences related to economic, social, and environmental values. For example, failure to review and revise health and safety practices following major incidents or accidents, as well as the failure to identify local communities within and potentially impacted by management activities. Additionally, insufficient fund allocation for the implementation of a management plan can weaken the long-term economic viability. Lack of protection measures for natural watercourses, water bodies, and riparian zones, as well as inadequate monitoring of social and environmental impacts, can worsen these issues. Furthermore, failure to minimize or avoid fertilizer use and improper handling of waste material can further contribute to environmental degradation.

Low risk indicators highlight issues related to past non-compliance with Thailand's FSC-FM certification standards. However, these problems can be promptly addressed within a short time frame as they represent common operational practices that can be immediately implemented and have minimal or negligible effects on the forest plantation. Additionally, they are associated with a relatively low concern from the stakeholders. Examples include challenges associated with a lack of job-specific training and worker supervision to contribute safely and effectively to the implementation of a management plan and all associated activities. Additionally, there is a lack of records related to fertilizer usage, up-to-date training records for relevant workers, or records of pesticide usage, including essential information such as trade name, active ingredient, quantity used, and reasons for use. Furthermore, a publicly available summary of the management plan, presented in a comprehensible format including maps and excluding confidential information, is usually not provided.

Indicators categorized under very low risk are usually related to issues of past non-compliance with Thailand's FSC-FM certification standards. In such cases, the likelihood of recurrence is very low, with no complaints reported on this matter. These issues are well evaluated and controlled by regulatory authorities, and are also supported by the key stakeholders and can be addressed in accordance with the standards. Examples include policies that prohibit offering or receiving bribes, with these policies being publicly available at no cost. Additionally, job opportunities are open to both women and men under the same conditions, with no indigenous people found in or around the certified area. Reasonable opportunities are communicated and provided to local communities, contractors, and suppliers for employment, training, and other services. Furthermore, equal pay is ensured for women and men performing the same work, and costs related to preventing, mitigating, or compensating for negative social and environmental impacts of the management activities are quantified and documented in the management plan. The strategies developed are effective in maintaining or enhancing HCV.

The results regarding principle 6, related to the environmental values and impacts, had the second-highest number of indicators that incurred a high level of risk. This finding corresponds with the research conducted by Sugiura and Yoshioka (2018) who reported about the companies certified by the FSC for forest management in Japan. Their survey revealed a significant improvement in the risk associated with principle 6 after the certification, ranking second only to principle 8. Conversely, principle 3 showed the least post-certification improvement, which was consistent with our findings. We found that every indicator had very low risk in non-compliance with the FSC-FM standard. This is because rubber plantations in Thailand have no indigenous people living in or around the certified area.

In addition, publicly available audit reports of rubber plantation in India indicate that the challenges faced by forest plantation managers in India are non-compliance with the FSC-FM standards most importantly HCV issues. This covers the lack of HCV assessment. This issue is similar to our study. Moreover, we also found that no names of stakeholders involved in HCV have been identified, no management plan has been developed, and no public summary of HCV has been published (FSC, 2018b).

Furthermore, an analysis of CARs from FSC audits of natural forest management in Indonesia indicated that most CARs were related to environmental and social issues (Hermudananto et al., 2018). Also, Halalisan et al. (2016) noted that principles 6 and 9 of the standard predominantly addressed the environmental concerns, although interpretations may vary by country. This finding is consistent with the study by Kuijk et al. (2009) that reported collecting data on non-compliance with the FSC-FM standards from some countries (predominantly temperate and boreal but also including tropical operations) and found that the most prevalent environmental requirements with issues related to principles 6 and 9. These included protection of riparian buffers and improved management of aquatic resources, woody debris, snags and legacy trees,

improved treatment of sensitive sites and the issue of HCV, and improved treatment of threatened and endangered species. Principles 6 and 9 issues were also found to be consistent in this study. We identified some high-risk issues within these principles, but the specific details of the risks differed. For instance, regarding the issue of HCV, previous studies improved treatment of HCV and endangered species. However, for most rubber plantations in Thailand, HCV has not been found, still the risk is high because the presence of HCV was not assessed, and little is known about the HCV. Furthermore, Sugiura et al. (2013) reported that the certification bodies frequently require improvements in community relations, workers' rights, environmental impact, management plans, and monitoring and assessment in Asian countries.

Non-compliance based on the FSC-FM standard was identified in rubber plantations of each type, and categorized by the number of indicators at risk at each level (see Table 2). The results indicated that over 64 percent of all indicators posed a very low risk. Among them, Type A, B, and C exhibited the highest number of very low risk, followed by high, moderate, and low risks, respectively. Notably, Type D had the most pronounced tendency towards low risk, followed by high, low, and moderate risks, respectively.

Figure 3 illustrates the distribution of indicators at each risk level for rubber plantations non-compliant with FSC-FM certification standards, categorized by principle. All the Types A, B, C, and D rubber plantations exhibited the highest risk to principle 1, which is related to compliance with laws, emphasizing an organization's obligation shall comply with all applicable laws, regulations and nationally- ratified international treaties, conventions, and agreements.

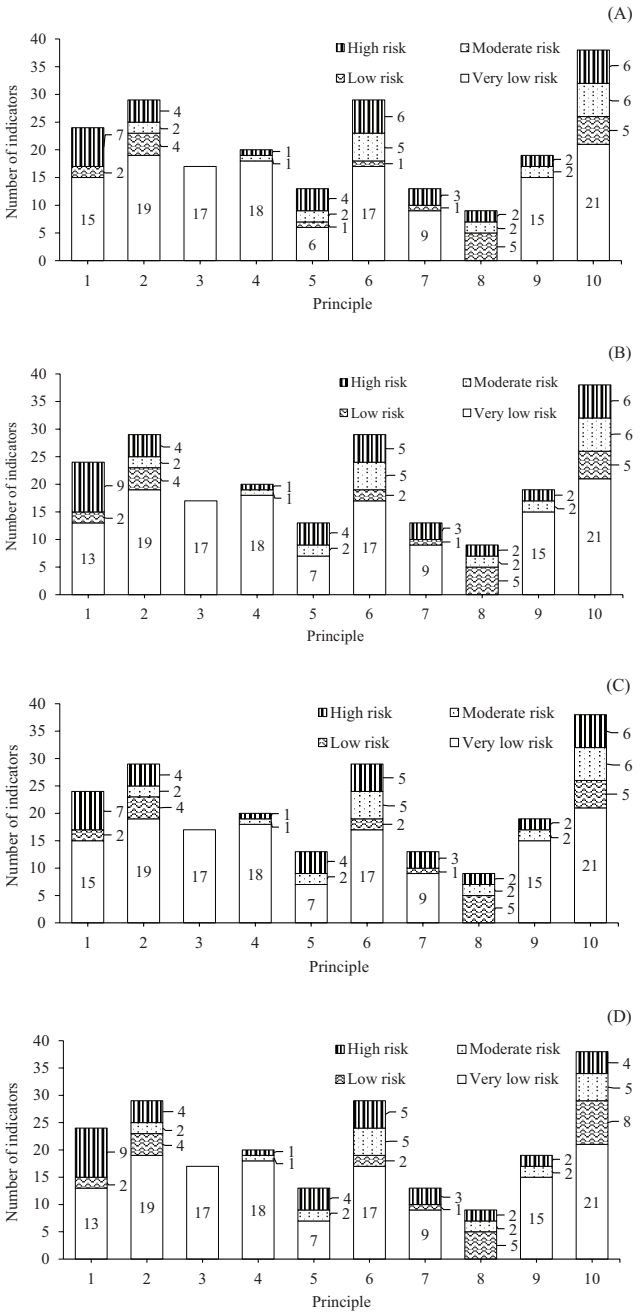

Figure 3 Number of indicators found at each risk level of rubber plantations non-compliant with the FSC-FM certification standards of each type, classified according to the 10 principles: (A) Type A - rubber monocultures; (B) Type B - rubber intercropping with wood based plants; (C) Type C - rubber intercropping with non-wood based plants; (D) Type D - rubber intercropping with wood and non-wood-based plants.

Table 2 Number of indicators at each risk level found in rubber plantations non-compliant with the FSC-FM standard.

Rubber plantation type	Number of indicators (%)				Total
	Very low risk	Low risk	Moderate risk	High risk	
Type A	137 (64.93)	19 (9.00)	20 (9.48)	35 (16.59)	211
Type B	136 (64.46)	19 (9.00)	20 (9.48)	36 (17.06)	211
Type C	138 (65.41)	19 (9.00)	20 (9.48)	34 (16.11)	211
Type D	136 (64.46)	22 (10.43)	19 (9.00)	34 (16.11)	211

Comparison of Differences in the Risk of Non-Compliance with the FSC-FM Standard Across Different Types of Rubber Plantations

We used the Kruskal-Wallis test to compare risk levels across different types of rubber plantations in Thailand. The results showed that the differences in risk related to non-compliance among the four types of rubber plantations with the FSC-FM standard were not statistically significant (p = .997). This suggests that the type of rubber plantation did not significantly influence the compliance with the FSC-FM standard. However, when examining the individual indicators, each type of rubber plantation exhibited varying number of indicators at different risk levels. In total, seven indicators were identified (see Figure 4), including:

1.5.1 Compliance with applicable national laws, local laws, ratified international conventions and obligatory codes of practice relating to the transportation and trade of forest products up to the point of first sale is demonstrated.

1.5.2 Compliance with CITES provisions is demonstrated, including through possession of certificates for harvest and trade in any CITES species.

5.1.1 The range of resources and ecosystem services that could strengthen and diversify the local economy are identified.

6.3.3 Where negative impacts to environmental values occur, measures are adopted to prevent further damage, and negative impacts are mitigated and/or repaired.

10.7.1 Integrated pest management, including selection of silviculture systems, is used to avoid, or aim to eliminate, the frequency, extent and amount of chemical pesticide applications, and result in non-use or overall reductions in applications.

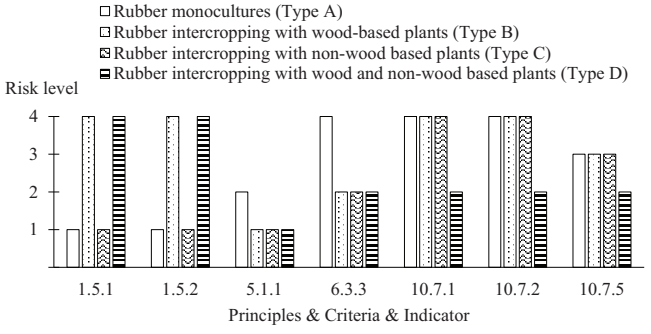

Figure 4 Risks of rubber plantations in each type, classified by indicators.
Note: Risk level 1 = very low, 2 = low, 3 = moderate, and 4 = high.

10.7.2 Chemical pesticides prohibited by FSC's Pesticide Policy are not used or stored in the Management Unit unless FSC has granted derogation.

10.7.5 If pesticides are used, application methods minimize quantities used, while achieving effective results, and provide effective protection to surrounding landscapes.

In Figure 4, the first number on the x-axis denotes the principle, the second represents the criterion, and the third indicates the indicator. The figure indicates that indicators 1.5.1 and 1.5.2 for type B and D plantations have higher risk than type A and C plantations because some species shall comply with the applicable national laws, local laws, ratified international conventions and obligatory codes of practice relating to the transportation and trade of forest products up to the point of first sale is demonstrated. This compliance is the subject of legal proceedings and stakeholder concern. The plantations falling in this category accompany the possibility of planting species listed in CITES and the Convention on Biological Diversity (CBD) appendices, necessitating additional regulations for import, export, or transit permits, obtained from the Thailand Director-General of Agriculture. Upon inspection, two species listed in Appendix 2 were identified, namely, *Aquilaria crassna* Pierre ex H and *Dalbergia cochinchinensis* Pierre (Convention on International Trade in Endangered Species of Wild Fauna and Flora, 2023). If the planted species were restricted trees as per the Royal Decree on Restricted Timber, challenges may arise in relocating them, requiring certification of ownership and tenure rights. Type A and C plantations do not encounter such a problem because type A plantations is a monoculture of only rubber trees in the area. Type C most planted species do not have to comply with such laws.

Indicator 5.1.1: type A plantations have a higher risk compared to type B, C, and D plantations because they are less capable of utilizing a range of resources and ecosystem services that could strengthen and diversify the local economy. Type A plantations primarily produce only rubber wood and latex, which generate limited income, whereas type B, C, and D plantations have a broader range of resources and services.

Indicator 6.3.3: type A plantations are at high risk compared to type B, C, and D plantations, which have low risk, because type A challenges are associated with negative impacts to environmental values and various measures. It is not used to prevent damage, resulting in soil erosion and tree instability while type B, C, and D plantations can mitigate environmental impacts and had a positive impact on the environment by encouraging tree

planting in rubber plantations, aiding in soil retention, moisture increase and, erosion reduction.

Indicators 10.7.1, 10.7.2 and 10.7.5: type A, B and C plantations have higher risk than type D plantations because such were identified involving the use of chemical pesticides which were prohibited by the FSC restricted list, such as Paraquat dichloride and Glyphosate-isopropylammonium. These chemicals are categorized as hazardous by the Department of Agriculture. Moreover, type D plantations do not use chemical pesticides within the rubber plantation, avoid and use no chemical pesticide use, aligning with FSC restricted guidelines. They also have minimal weed growth due to a dense canopy cover and pets brought into the area to use the grass as food.

From the results of this research, there are recommendations for specific actions that can be taken to mitigate risks for each plantation type as follows: type A plantations should prioritize diversifying the number of obtained products to strengthen the local economy, such as charcoal and mushrooms, and mitigate environmental risks, such as soil erosion by planting cover crops. Types B, C, and D plantations should exercise caution when dealing with species listed in CITES or any restricted trees, and strictly following the relevant legal procedures, conventions, and guidelines throughout the operations.

Conclusion and Recommendation

From the risk assessment of rubber plantations related to non-compliance with the FSC-FM standard, it was observed that out of the 211 indicators, 136 were categorized under very low risk, while 19, 20, and 36 indicators were classified under low, moderate, and high risk, respectively. This indicates a significant compliance among the sampled rubber plantations in Thailand. The high-risk indicators were mostly found in principle 1, which pertains to compliance with the law, followed by principle 10 related to management activities, implementation, and principle 6 related to environmental values and impacts. The most common high-risk indicators, involve legal challenges that are difficult to solve. Key issues include inadequate documentation of land tenure, unclear plantation boundaries, non-compliance with laws, and delays in payments, all of which have serious legal implications and require immediate attention. Moderate risks indicators are mainly found in the implementation of management activities and are issues that can be resolved immediately without requiring extensive time. These issues have significant social, ecological, and economic value, such as failure to minimize or avoid fertilizer use and improper handling of waste material. Low risk indicators often involve problems arising from a lack of records or the absence of documentation prepared as evidence for each activity. Examples include a lack of records related to fertilizer usage, up-to-date training records for relevant workers, or records of pesticide usage. These problems can be promptly addressed within a short time frame as they represent common operational practices. Very low risk indicators are issues that agencies can easily implement. Examples include gender equality in employment and pay, disclosing information shall make publicly available information free of charge, excluding confidential information.

Addressing these risks requires proactive measures, which include the development of guidelines for prevention and mitigation, to ensure readiness for FSC certification. This study focused solely on rubber plantations. Thus, to have a comprehensive understanding of the adherence challenges related to FSC-FM standards, data collection should be extended to other forest plantations encompassing different tree species such as teak and eucalyptus in Thailand. Specific precautions need to be taken for each type of rubber plantation concerning compliance issues. Type A plantations should prioritize diversifying the number of obtained products to strengthen the local economy and mitigate environmental risks such as soil erosion. Types B, C, and D plantations should exercise caution when dealing with species listed in CITES or any restricted trees, and strictly following the relevant legal procedures, conventions, and guidelines throughout the operations.

The risk information from rubber plantations that are non-compliant with the FSC-FM standard can help streamline the related implementation plan to ensure compliance with FSC standards and is integral to understanding and addressing the problem that could compromise the long-term sustainability of rubber plantations. Effectively managing these risks is crucial not only for achieving, maintaining, and increasing FSC certification but also for ensuring that the plantations remain economically viable, socially responsible, and environmentally sustainable in the long term.

This research contributes to the sustainability of the forest plantation economics, society, and the environment values, such as biodiversity conservation, sustainable resource use, climate change mitigation, supporting local communities, labor rights, community benefits,

the economic viability of rubber plantations, market access and premium prices, and long-term forest productivity. This is an important part in driving the Sustainable Development Goals. Furthermore, this research can support plantation managers, policy makers, and other stakeholders (such as the Rubber Authority of Thailand, which is the central organization responsible for managing the country's rubber system) in developing their own rubber plantation management systems and setting local and national policies to expand the certification area of rubber plantations in Thailand. This includes promoting and access to forest certification system for rubber plantation owners and rubber wood consumers to organize a training program, and establish awareness and readiness to enter the forest management certification system of rubber plantation owners and rubber wood consumers at various levels. These tasks shall be conducted by the Thailand Rubber and other educational institutes.

This research focused on areas where rubber is predominantly grown in Thailand, specifically in the southern and eastern regions. Future research may collect data on rubber plantations in other areas, such as the northern and northeastern regions.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Indicator guidelines for the Green Office Standards (GOS) of Thailand

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Abstract

The objective of this research article is to promote the establishment and certification of the Green Office Standards (GOS) in Thailand by providing its indicator-guidelines, categorized into six groups having specific aims in the work procedure, including (1) Preparation of policies, planning work procedures, and perpetual improvement; (2) Awareness creation through communication; (3) Consumption of energy and other resources; (4) Management of generated waste in the office; (5) Safeguard of the office environment; and (6) Selection of eco-friendly products in office procurement. This research used Ethnographic Delphi Future Research method, where the researchers selected 17 members as a panelist of an expert group to consider their opinion and advice. GOS is important as it aims to minimize resource usage in the daily work operation, to reduce CO_2 emission from offices' work procedure that produces an impact on the environment. The result of the research led to the creation of GOS indicator guidelines, to help offices that have aspirations to become certified holders of GOS certificates, and finally concluded that the formulation of indicator guidelines of the GOS was successful in awarding the GOS to organizations in Thailand that participated and followed the norms according to the indicator guidelines prepared by the GOS Management of Thailand. Following these six groups of indicator guidelines will help to create an eco-friendly green sustainable environment for the future world too.

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Introduction

The Green Office Standard (GOS) is an office management program aimed at minimizing the consumption of resources and generated waste in the daily operation of office work. The manifest function of the Green Office is to save unnecessary consumption of resources so that CO_2 emission, which has an impact on the environment, due to the office's work procedure can be minimized (World Wide Fund for Nature [WWF], 2016).

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The GOS of Thailand was developed to create a sustainable environment by offering indicator guidelines to those offices that aspire to be awarded as a certified green office management standard (Aroonsrimorakot & Sarapirom, 2020). It is essential to have a certified GOS to bring changes in the office's work process. Following the GOS in the office's daily operation will help to create a healthy environment with its many benefits in terms of saving resources, recycling waste products, less energy consumption, and reduction of pollution. The Green Office Standard is important as it will help to train and motivate staff in office management by being responsible for office resource usage. A certified GOS helps to bring perpetual improvement in the daily work operation and environment, as it minimizes the office's resource consumption and waste. It is commonly observed that the daily operation of the office in Thailand consumes lots of paper, ink, electricity, and other resources, which generates lots of waste that produces greenhouse gases, harmful to the environment. So, certification of the GOS is very important to all kinds of organizations, and to help participating organizations. The GOS prepared the indicator guidelines to motivate staff to follow the norms and guidelines of GOS for creating a sustainable environment.

Literature of Review

Green Office Standards Project in Thailand has been launched under the initiative and sponsorship of Department of Environmental Quality Promotion (DEQP), which is an organization that provides funding for sustainable environmental projects. The GOS project has been initiated for environmental sustainability related to office management and work process. In previous studies, the author emphasized the importance of GOS initiatives to achieve the target of sustainable development goals and recommended upgrading the GOS in Thailand at the international level (Aroonsrimorakot et al., 2020). Further, it has been mentioned in another study that a sustainable office is necessary to maintain a sustainable environment, which can be achieved with the initiative of the GOS, which provide guidelines and responsible practices, to bring behavioral changes to the office staff in their daily office work operation (Aroonsrimorakot et al., 2019b). It has been commonly observed that careless office workers consumed lots of unnecessary office resources, which has caused the generation of lots of waste, such as unused paper because of printing only one side of the paper, ink, electricity, water, etc. The GOS provides guidelines for the procurement of daily essentials of the office, by taking care to select only those items of paper, ink, electric bulb, and energy that save resources and also, which are environmentally friendly along with responsible behavior and awareness of office employees. There should be only a minimum amount of waste with the initiative of the GOS, and if generated waste should be recycled, if applicable, the unused waste should be properly managed to prevent deterioration of environmental conditions (Chowdhury et al., 2014). The GOS was created to minimize CO_2 emission in the atmosphere, that pollutes the environment, by changing office staff's working behavior practice (Scafetta, 2010) because daily operation consumes lots of energy in air-conditioner, lighting, printer, computer, etc. and also, official vehicles used for traveling to attend meeting or seminar consumes lots of fossil fuel energy that pollutes the environment (Sodangi et al., 2011). As a safeguard, it is essential for offices to initiate precautions to minimize the impact of office work operation through training and motivating staff to save resources, to use only those resources that are eco-friendly. Here lies the importance of certifying offices with the GOS, for those offices that are qualified. As a step to initiate offices to become qualified Green Office, the management of the GOS has prepared the indicator guidelines which any participating office has to follow to minimize waste and consumption of resources to solve environmental impact from daily office work operation process (Aroonsrimorakot, 2018; Aroonsrimorakot et al., 2019a; Wichaiutcha & Chavalparit, 2019; WWF, 2010). The development of GOS provides offices with the working guidelines or indicators to be green office and this process is implemented through training for developing awareness about the harmful impact of environmental pollution while promoting the advantages of promoting saving, social, and ecological practices for environmental sustainability (Aroonsrimorakot & Sarapirom, 2020). Aroonsrimorakot & Phuynongpho (2017) highlighted the need to reform all offices in Thailand into the GOS by performing office work practices according to the indicator-guidelines prepared by the management committee of the GOS, Thailand. These indicators include guideless for saving water, consumable resources, and energy; innovation in building design and usage of eco-friendly raw materials in construction, promotion of reusing waste and unused products through recycling, discard fossil fuel energy by replacing with renewable energy (Hong Kong Green Building Council, 2016; World Green Building Council, 2016). Another study reported the importance of following environmentally friendly strategies in terms of resource consumption and office procurement to aid economic development with a sustainable environment

(Varanavicius & Navikaite, 2015). So, DEQP in Thailand has supported, designed, and evaluated the result of the GOS implementation in Thailand's offices since 2013, and gradually the head office of the GOS spread out into many branches all over Thailand. From the above literature review, it can be seen that the main goal of GOS establishment is to bring behavioral change among office staff, to lead a sustainable lifestyle to lessen the impact of office work procedures on the environment. Following the GOS will help to create a green and safe world for all living beings to live and perpetuate sustainably (WWF, 2017). Aroonsrimorakot et al. (2019b, 2020) reported some guidelines/ principles for the GOS such as 1. Resource-saving; 2. Staff training to initiate behavioral changes by creating awareness for environmental sustainability.

Objectives and Methods of the Study of Indicator Guidelines for the Green Office Standards (GOS) of Thailand

Objectives

The general objective of this research article is to promote the establishment and certification of the GOS network in Thailand by providing its indicator-guidelines. Along with this includes the manifest aims, that is, to provide the principles or indicator-guidelines of the GOS Thailand, categorized into six groups with the following headlines: (1) Preparation of policies, planning work procedures, and perpetual improvement; (2) Awareness creation through communication; (3) Consumption of energy and other resources; (4) Management of generated waste in the office; (5) Safeguard of office environment; and (6) Selection of eco-friendly products in the office's procurement.

Methodology

Regarding the methodology, this research used Ethnographic Delphi Future Research (EDFR), a combination of Ethnography (Byrne, 2001; Genzuk, 2003; Hammersley, 2016; Palmer, 2001; Van Maanen, 1996), and Delphi Future Research (Dalkey & Helmer, 1963; Hirschhorn, 2019; Hirschhorn et al. 2018; von der Gracht, 2012). Field work of ethnography research is usually conducted by a researcher who lives, observes, and participates in the daily life and activities of the people living in the field. On the other hand, the Delphi method resembles the survey technique of collecting data, but in this method, instead of selecting a sample for study, it selects an expert group panel, who has in-depth knowledge of the area or topic of the research. The researcher, therefore, selected 17 members comprising of academicians and policymakers as a panelist of an expert group to consider their opinion and advice. The duration of the research was 2 years (2016–2018). It is considered significant to apply the EDFR technique as this combined method helps to lessen the shortcomings of each methodology (Poolpatarachewin, 2015). The benefit of the EDFR technique is due to its ability to gather opinions and ideas from expert panelists impartially and anonymously (Beech, 1991; Williams & Webb, 1994). There are three major steps for creating the GOS as follows: (1) Mobilization of the expert panel group: This step consists of selecting a group of experts, 17 members from both public and private organizations, who have experience and knowledge of environmental studies, to form a panel, discuss and gather their ideas and views. These experts were from the Faculty of Environment and Resource Studies of Mahidol University, DEQP, the Department of Pollution Control Thailand, the organization of Greenhouse Management Thailand, the Center for Nature and Agricultural Ecology, Thailand's Electricity Generating Authority, Bangchak Corporation; 2. Review of literature to draft the Standards; and 3. Defining the purpose of the Standards: The definition and purpose of the research, methodology, and steps of the study along with their duties were disclosed to the selected panelists. They were requested to have full commitment despite the lengthy duration of the research.

Procedures and Instrumentation

This research article aims to present the indicator guidelines checklist for certifying an office as a qualified GOS. Each checklist response – distribution was done through "Workshops" (Poli, 2018; Thoring et al., 2020; Turoff & Linstone, 2002). Each of the panelists was contacted with a letter by email, telephone, as well as by post, informing them of the purpose of the research, requesting them to become a member of an expert panel group, to spare time to participate in discussion and meeting of the three workshops, despite their busy schedule, to share their knowledge and opinion, and assuring them that all information provided would be kept confidential. Each of the workshops took about one to two days with a gap of four weeks for the next workshop to follow.

Workshop 1

The main objective of organizing the workshop was to assemble the expert panelist to get their idea and opinion from the discussion. In the first step, ten sample guidelines were prepared and then distributed to the panelists as was discussed in a previous study

(Aroonsrimorakot & Sarapirom, 2020). The sample guidelines contained an indicators checklist of the following components: 1. Organization awareness; 2. Energy & Other Resources; 3. Waste Management 4. Indoor & Outdoor Environment; 5. Green Procurement; 6. Continual Improvement; 7. Staff communication/ Participation; 8. Issue of logistics or transportation; 9. Consumption of resources such as water; and 10. Construction design. These 10 possible standards guidelines were views and opinions gathered from the expert panelist group, who has experience working in both public and private organizations, selected and recruited by DEQP. The panelists were explained the purpose of the research and were requested to fill-in information regarding their views in an open-ended questionnaire, prepared specially for the research.

Workshop 2

The first workshop was followed by the second workshop where the summary and conclusion of the 1st workshop was checked and considered to set up the indicator-guidelines for the GOS, Thailand. In the 2nd workshop, improvement was made from the report of the first.

Workshop 3

All comments and recommendations of the panelists in the second workshop were incorporated into the 3rd workshop checklist and then distributed to all workshop participants to obtain further improvement and insights during the 3rd workshop discussion. The summarized review, comments, and conclusion from all these workshops led to the creation of the indicator guidelines for the GOS, Thailand. These indicator guidelines details can be divided into six groups as given below in Figure 1.

Results

The indicator-guidelines for certifying offices as a qualified GOS are discussed below. These guidelines were improved from the valuable comments obtained from the expert panelists. Their critical views such as guidelines for indoor and outdoor standards led to improvement as per the WWF guidelines of GOS. The result of the research led to the formation of the above indicator-guidelines as given in Tables 2–7, having a specific percentage of weightage for each indicator as shown in Table 1. The evaluation of each of these indicators will be based on the characteristics of the office, location, behavioral practice of the office staff, compliance with GOS rules, awareness, education, and communication of the GOS staff, and the measured amount of emitted greenhouse gas in the office. DEQP has created the indicator-guidelines after assessment and evaluation through research and testing with projects so that GOS can be promoted to those eco-friendly offices in Thailand that aspire to be certified as a GOS, since 2013. Currently, Green Offices has expanded to all parts of Thailand, comprising both public and private organizations. The main indicator – guideline of becoming a qualified Green Office in Thailand is to perform daily office work activities with consideration of not harming the environment with pollution, which can be promoted through behavioral change, to result in a sustainable lifestyle, society, and economy. Since 2013, DEQP has evaluated more than 300 offices in Thailand that have sought to become qualified holders of the GOS certificate. The article is significant to promote perpetual evaluation of the working process of offices in Thailand so that all offices that apply to get the GOS are certified to achieve development and performance with environmental sustainability as per the UN sustainable development goals.

The summary and conclusion of the above three workshops and assessment of ten pilot green offices resulted in the establishment of the GOS, including its indicator guidelines, by incorporating the opinion and comments of a group of expert panelists who were specialists in the field of environmental science, education, and management. These indicators are created following the ISO 14001 management indicators protocols with objectives of a sustainable environment and promotion of the GOS all over Thailand. Table 1 shows the indicator guidelines with weightage for green office standards in Thailand

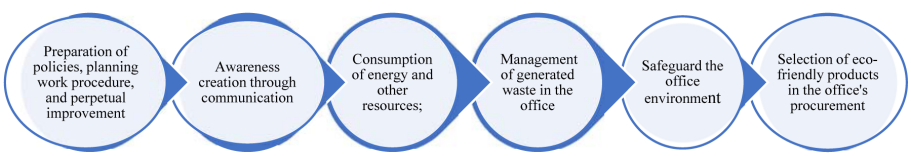

Figure 1 Six groups of indicator guidelines

Table 1 Indicator guidelines for the establishment of GOS in Thailand

No.	Indicator-Guidelines	Weightage
1.	Preparation of policies, planning work procedures, and perpetual improvement	25%
2.	Awareness creation through communication	15%
3.	Consumption of energy, water, and other resources	15%
4.	Management of generated waste in the office	15%
5.	Safeguard the office environment	15%
6.	Selection of eco-friendly products in the office's procurement	15%

Table 2 Indicator guidelines for the preparation of policies, planning work procedures, and perpetual improvement of the Green Office Standard in Thailand

Indicator-Guidelines
1. Preparation of policies, planning work procedures, and perpetual improvement of the Green Office Standard in Thailand
1.1 Guidelines of policies - An authorized person needs to: approve it, confirm the date of the scheduled policy declaration, and describe the aims of GOS, along with involvement to perform as per the environmental policy guidelines. - Need to organize the office GOS indicators as per the environmental scopes and contexts for continual performance including a reduction in office resource consumption, waste generation, greenhouse gas emission, and replacement of fossil fuel energy with renewable energy. - All office staff should abide by the rules sanctioned by DEQP and also promote stakeholders' awareness - The annual GOS should be planned and should get approval in writing by the concerned executive officer - The annual target of energy, water, paper, ink, waste, and greenhouse gas should be indicated
1.2 Formation of a working group - A committee of staff should be appointed, consisting of each departmental representative, and then assigned a particular responsibility
1.3 Specification of resources and issues - All office activities should be compiled and specified for evaluating to check whether they can be awarded the GOS certificate - A qualified person who is aware of the laws and regulations of the GOS responsibilities should be recruited to specify the quantity of resource consumption such as energy, waste, paper, ink, the amount of generated waste, etc. - The concerned officer should review, evaluate, and summarize the important environmental issue of offices' daily work process in writing.
1.4 Laws and safety rules - A legal officer, recruited for preparing environmental laws and safety rules indicators, should compile all kinds of the latest laws on environmental issues and review them at least one time annually. - The recruited legal officer should check and evaluate whether the office management is following the sanctioned office laws or not, and investigate if it is inconsistent to find a solution for improvement
1.5 Information on Greenhouse gas (GHG) - All data on greenhouse gas emissions from daily office activities should be gathered and evaluated to investigate whether the emitted amount is diminished or increased. For unachieved target goals, there should be provision for improvement and periodic monitoring with a written solution guideline.
1.6 Project planning for perpetual improvement - For achieving the target objective and for perpetual improvement of the GOS, it is essential to adopt innovative activity, consume eco-friendly resources, recruit a qualified person to monitor project schedule and activities periodically
1.7 Internal audit for GOS - It is essential to have a systematic planning and procedure with a scheduled annual time frame to perform internal auditing of all office work process
1.8 Reviewing of office administrative activities - It is essential to define the quorum for reviewing office administrative activities, including the invitation of the competent executive to join in the meeting, mandatory participation of executive from each department, formation of a committee of executives - Conduction of each meeting should have at least 75 percent executive committee members - There should be agendas for reviewing administrative activities meeting, operations, and policy planning with a written conclusion in the form of a meeting report for perpetual improvement

Table 3 Indicator-guidelines for office staff awareness creation through communication

Indicator-Guidelines
2. Awareness creation through communication
2.1 Plan training schedule, operation, and evaluation - It is essential to have a systematic plan for the training schedule, place of training, and evaluation of the training program. A qualified teacher should be recruited to provide training to office staff. Each trainee should compulsorily attend 80 percent of each course, and the achievement and performance of the training should be evaluated through tests and written examinations.
2.2 Canvassing and communication with employee - Need to recruit a responsible person to canvass and communicate with the employee on environmental issues and policy in a properly established channel. The policy includes management, current issue, law, tidiness, systematic maintenance, measurement of energy and other resource usage, greenhouse gas emission, and generated waste. Also, there should be periodic canvassing of staff and employee to share knowledge of the GOS
2.3 Provide channels for communication, recommendation and improvement - A responsible person recruited for communication and canvassing should prepare a channel to receive a recommendation for improvement, which can be received through a QR code and website. - All recommendations and suggestions received from various sources should be compiled together, reviewed, and published on the official website or a notice board so that everybody can read it for information and improvement.

Table 4 Indicator guidelines for the consumption of energy, water, and other resources

Indicator-Guidelines
3. Consumption of energy, water, and other resources
3.1 Consumption of energy - There should be the availability of properly written guidelines for the consumption of energy in the daily office work process - All office staff should be educated to bring awareness of the benefits and ways of saving office resources by procuring eco-friendly products, taking responsibility, adopting and changing innovative devices, appliances, and equipment to save electricity - Advantages of switching fossil fuel energy to renewable should be promoted and introduced - During lunch break or not at work, the office electrical switch should be put off without light or air-conditioner
3.2 Consumption of water - To be a certified GOS, all office staff should follow the proper indicators for the consumption of water and be educated to create awareness about the benefits of less water consumption by using innovative appliances that can save water - Monthly consumption data units should be collected and compared to check whether it achieves the target goal or not. For unachieved target goals, there should be solution guidelines, such as changing the consumption behavior of staff through periodic water usage assessment - For achieving the target goal, the conclusion result should be summarized in a written report to follow in future ways of consumption for perpetual improvement
3.3 Consumption of fossil fuel and other resources - There should be guidelines and communication for fossil fuel energy usage to bring lifestyle and behavioral change. - All official trips or travel should be reformed such as switching to go to work, if not far, on foot or by bicycle, and if far, to go by public bus - There should be guidelines to save paper, ink, and other resources through education, and communication to bring awareness to staff about the environmental benefits of saving resources through behavioral change and ways of using these resources, such as switching to e-documents instead of printed manuscript, printing both sides of a page instead of only one side - There should be a plan to target the goal of consumption of fossil fuel and other resources with annual usage data collection to check whether the goal is achieved or unachieved. If unachieved, the cause or reason should be sorted out to find a solution guideline. If the target is achieved, a report should be prepared to follow for continual improvement
3.4 Meeting, seminar, workshop, and conference - The pattern of the official meeting, seminars, workshops, and conferences should be switched to the form of a virtual or online mode - There should be indicator guidelines for electronic communication in the form of e-mail, QR code, application of various social media and chat group - Venues for a meeting, seminars, and conferences should be designed using eco-friendly products to consume less energy in light, sound, and other resource equipment. Care should be taken while selecting a room/ auditorium as a venue for a meeting or seminar so that the selected is neither too large nor too small, but proportionate appropriately to the number of invited participants - The decoration of the seminar venue should use a standard quality material - There should be e- reports or e- media for seminars, meetings, and conference - Eco-friendly food, dishes, utensils, spoons, water bottles, etc. should be used for catering seminars, meetings, or conference

Table 5 Indicator guidelines for the management of generated waste in the office

Indicator-Guidelines
4. Management of generated waste in the office
4.1 General waste management - Proper guidelines should be prepared for general office waste management such as separating the type of generated office waste, collecting different types of waste and their disposal - All generated office waste should be placed in different types of waste bins, with different labels placed on those bins as general waste, recyclable, or hazardous. These waste bins should be placed in a proper area in the office corners - There should be the availability of an appropriate collection point for different office departments - Different types of waste in all types of bins in the office should be periodically assessed - A responsible person assigned for waste management of each locality should inspect and manage the generated waste regularly - There should be a facility for waste recycling to lessen the amount of disposed waste and waste utilization, using the 3Rs upcycling - A responsible person should periodically assess and analyze the generated waste data and then prepare comparative data such as per month or annually. This will help to investigate whether the target-generated waste is achieved, increased, or decreased. If increased, there should be a provision of a solution guideline to achieve the target waste. If the target goal is achieved, it should be prepared in a written report to be displayed on the office notice board or website to achieve continual development of optimum target waste management.
4.2 Management of wastewater - There should be the availability of proper guidelines for the management of wastewater with periodic assessment of wastewater quality. A responsible and qualified person should be recruited to check and assess the wastewater quality periodically, to investigate whether the treated wastewater quality meets the standardized quality - Wastewater should be efficiently treated using innovative and efficient wastewater treatment tools and system - The recruited responsible person should check whether there is any leakage in the pipe, the presence of dirt, and contamination. - If contaminated, steps should be taken to provide solution guidelines for improvement

Table 6 Indicator guidelines for safeguarding the office environment in the GOS, Thailand

Indicator-Guidelines
5. Safeguard the office environment
5.1 Quality of air - A responsible person should be recruited to check and assess the quality of air in the office. There should be the availability of proper indicators - guidelines to bring awareness to office staff. - The recruited person, such as a technician should periodically check the performance and servicing of all office appliances, such as air-conditioners, computers, lighting, printers, fax, copying machines, etc. - For any complaint of malfunctioning, the responsible person should be available to repair when called by the office for maintenance - The recruited technician should regularly check the emission of gases that cause air pollution - Office premises should specify a zone for smoking and it should be located in a space, preferably near a door or exit, for the smoke to vanish quickly without causing a health hazard to non-smokers - There should be a campaign to promote the “Smoking prohibited” slogan - Construction, renovation, or repairing work of an office building should take steps and precautions to prevent air pollution such as providing the employee a specific area far away from pollution effect - It is also essential to display a signboard as “ Entry Restricted” at the construction or renovation site
5.2 Office lightning - There should be guidelines to measure the intensity of light and performance. Light equipment selected for office usage should conform to ISO standards. - A responsible technician should regularly check and assess the capacity and performance of all office lighting equipment. If there is any fault, it should be replaced. - The lighting equipment used in the office should be energy-saving and eco-friendly
5.3 Control of noise in an office - There should be guidelines to measure and control noise pollution in office premises. All noise equipment selected for office usage should be checked for GSO conformity. - There should be management and assessment of noise pollution at the repairing or construction site of offices in compliance with GOS - Care and support should be available so that it does not cause health hazards to both employees and construction workers
5.4 Management of office livability - There should be the availability of indicator guidelines to measure and manage livability in office operations such as: Specifying internal and external areas of the office in the form of a diagram; Specifying the internal as well external zone functions in the diagram of the office building; Specifying cleaning and repairing time for both inside and outside of repairing area; Providing the usable area and maintenance area percentage; Providing guidelines to control infected animals and transmission of disease in the office by tracing and tracking infected animals monthly.

Table 6 Continued

Indicator-Guidelines
5.5 Preparation for emergency There should be guidelines to prepare and control the emergency in the office in the following ways: - Providing training to firefighters and other staff with a plan for evacuation in case of fire and other emergency outbreak - There should be mandatory training of office staff for emergency readiness with at least 40 percent of staff completing the training course. All trainees who have completed the course successfully should be awarded a certificate - Need to educate all office staff about the ways of exit and escape for emergencies - All offices should have sufficient firefighting alarms and equipment - Training should be provided to at least four persons in an office on the usage, installation, and inspection of firefighting equipment

Table 7 Indicator guidelines for the selection of eco-friendly products in the office's procurement

Indicator-guidelines
6. Procurement of eco-friendly products for office usage - There should be the recruitment of a qualified and responsible official who knows about purchasing eco-friendly products - There should be a specification of a list of eco-friendly products that are usable in office operation with the source where they can be procured - Request to supply eco-friendly products to the supplier - Assess and estimate the proportion of eco-friendly products that are used in the office - The supplier should be a certified holder of ISO and environmental standards - In case the supplier is uncertified, it should be informed and educated to become a certified agency or supplier - It is essential to calculate the eco-friendly percentage of each office's procurement by specifying the brand, model, labeling, quantity, and value of purchased office items - If a full–time employee is hired for eco-friendly procurement of office goods, the employee should be checked and evaluated monthly - If a part-time employee is hired for eco-friendly procurement of office goods, the person should always be checked and evaluated whenever present on duty in the office - There should also be an evaluation for selecting eco-friendly services external to the office too such as to check whether the service provider is registered or a Certified Company - All procured goods should be listed to be obtained from certified ISO agencies - All meeting places and hotels selected should be certified as eco-friendly green hotels or green avenues. If uncertified, an alternative place that is near and easy to reach to travel with the availability of facility or arrangement for travel should be considered to make the meeting place green and sustainable

Discussion

Each of these indicator guidelines consists of various sub-guidelines as discussed above in Tables: Table 2, 3, 4, 5, 6 and 7.

Conclusion

This article is the result of research assisted by DEQP, Thailand with aims to standardize all offices in Thailand as Green Offices by becoming eco-friendly, having environmental benefits and awareness, through education, communication, and awareness, to bring behavioral changes of office staff in terms of office resource usage, planning, purchasing, designing, emergency, safety, waste management, etc. The result of the research led to the creation of GOS indicator guidelines, to help offices that have aspirations to become certified holders of GOS certificates. So, this research article presented the indicator guidelines of the Green Office to promote offices to do daily jobs in offices as per the guidance of the GOS indicators, having consciousness of the hazards of air and other gases pollution on the environment, by taking care and responsibility to minimize unnecessary resource consumption. Some common resources commonly consumed in most offices such as energy, water, paper, ink, etc. are unnecessarily wasted by reckless office staff without environmental consideration of wastage and greenhouse gas emission. So, the GOS provide six groups of indicators, namely, preparation of policies, planning work procedure, and perpetual improvement; awareness creation through communication; consumption of energy, water, and other resources; management of generated waste in the office; safeguard of office environment; and selection of eco-friendly products in office procurement. The indicators are prepared to educate office staff to use resources as per the guideline and to recycle generated stationary and other waste if applicable. So, it can be concluded that following these indicator guidelines by office staff in the daily work process will lead to

more successful certification of the GOS in Thailand. The significance of this study is that it highlights the establishment and promotion of the GOS all over Thailand as the GOS helps in systematic management and environmental performance improvement of offices in Thailand for a better sustainable world. Following these six groups of indicator guidelines will help to create an eco-friendly green sustainable environment for the future world too.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Empowering women in sustainable tourism development: Unleashing motivation and competence in Mandalika's super priority destination

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Abstract

The hierarchy of human needs is composed of five levels, ranging from basic physiological demands to needs related to self-actualization. In Mandalika as well as other parts of the world, women are becoming more and more influential in the tourism sector. Still, not much research has been done to determine what characteristics affect women's motivation and ability in this field.This study employs a mixed-method approach to gain a comprehensive understanding of women's motivation and competence in the tourism sector in the Mandalika Special Economic Zone (SEZ), a super priority destination. The findings reveal that women's motivation and competence can be categorized into four main areas: self-actualization, family support, economic drive, and employment opportunities. Family support, income from tourism, and inclusive job opportunities are critical factors influencing their work motivation. Women in this sector exhibit high satisfaction in contributing through their skills and knowledge, with educational background and foreign language proficiency being significant factors. This study provides a strong foundation for designing appropriate training programs to enhance women's contributions to sustainable tourism in Mandalika. The implementation of the study's findings will provide a solid basis for increasing women's sustainable contributions to the tourism sector in Mandalika.
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Introduction

This research explores the motivation and competence of women in the tourism sector of Mandalika Special Economic Zone (SEZ), Indonesia. The study focuses on women's participation, motivation, competence, and the tourism sector within the context of Mandalika SEZ. Women's participation refers to the involvement of women in the tourism sector, including their roles, contributions, and experiences. Motivation encompasses the factors driving women to participate in the tourism sector, such as self-actualization, family support, economic opportunities,

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and job satisfaction. Competence relates to the skills, knowledge, and abilities women possess to contribute effectively to the tourism sector. The tourism sector includes various industries such as hospitality, transportation, and recreation, which are critical to the economic development of Mandalika SEZ. Mandalika SEZ is a special economic zone in Indonesia designated for tourism development, providing a unique context for this study.

The objective of this research is to investigate the factors motivating women to participate in the tourism sector of Mandalika SEZ and to examine their competence in contributing to sustainable tourism development. The study aims to identify the motivations driving women's participation, explore the competencies women possess, and examine the relationship between women's participation and sustainable tourism development in Mandalika SEZ. By achieving this objective, the study aims to provide insights for policymakers and stakeholders to develop strategies that empower women and promote sustainable tourism development in Mandalika SEZ.

Research Gap

Despite the growing body of research on women's experiences in the tourism industry, there is a significant gap in the literature regarding the motivations and competencies of women working in the tourism sector of Mandalika SEZ. Previous studies have primarily focused on the challenges and barriers faced by women in the tourism industry, with limited attention paid to the factors that enable women to succeed and advance in their careers. Furthermore, existing research has largely concentrated on established tourism destinations, neglecting the unique context of emerging destinations like Mandalika SEZ. This study aims to address this research gap by exploring the motivations and competencies of women working in the tourism sector of Mandalika SEZ, and examining how these factors impact their job satisfaction and career advancement.

Specifically, the research gap can be identified in the following areas: There are significant gaps in the existing literature regarding women's motivations and competencies in the tourism sector of Mandalika SEZ. Firstly, there is a limited understanding of what drives women to work in the tourism industry and what skills and abilities they bring to the sector. Secondly, there is a lack of research on how these motivations and competencies impact job satisfaction and career advancement in the tourism sector. Finally, emerging tourism destinations like Mandalika SEZ have been neglected in existing research, leaving a void in our understanding of the unique challenges and opportunities faced by women in these contexts. By addressing these gaps, this study contributes to a deeper understanding of women's experiences in the tourism sector and provides valuable insights for industry practitioners, policymakers, and researchers seeking to promote gender equality and empowerment in the tourism sector.

This study aims to address the following key research questions:

1. What are the motivations and competencies of women working in the tourism sector of Mandalika SEZ?

2. How do these motivations and competencies impact their job satisfaction and career advancement?

This paper contributes to the field of tourism and gender studies by providing new insights into the experiences of women in the tourism sector of Mandalika SEZ. Unlike earlier work, which has focused on the challenges faced by women in the tourism industry, this study explores the motivations and competencies that enable women to succeed in this field. By examining the intersection of motivation, competence, job satisfaction, and career advancement, this research provides a more nuanced understanding of the factors that support women's career development in the tourism sector. The findings of this study have implications for tourism industry practitioners, policymakers, and researchers seeking to promote gender equality and empowerment in the tourism sector. In contrast to earlier work, this study uses a mixed-methods approach, combining both quantitative and qualitative data to provide a more comprehensive understanding of the research topic. Additionally, the study's focus on Mandalika SEZ, a newly developed tourism destination, provides new insights into the experiences of women in an emerging tourism context. Human needs are structured in a five-tier hierarchy, ranging from basic physiological needs to self-actualization needs (Susilorini et al., 2023). Motivation theory highlights that individuals' motivation results from a combination of factors, driving human behavior (Coote, 2022). Women play a significant role in the global tourism industry, contributing to gender equality, inclusivity, and sustainable tourism development (Yudanegara et al., 2021). In Indonesia, particularly West Nusa Tenggara (NTB), tourism development has accelerated, with Mandalika designated as a Special Economic Zone (SEZ) for Tourism (Rachmawati et al., 2020).

However, despite this growth, the contribution of women, particularly female workers, is often overlooked in academic studies (Wiastuti & Rashid, 2024).

Literature Review

Competency theory provides a framework for understanding, measuring, developing, and managing skills, knowledge, attitudes, and traits needed to succeed in various contexts (Nugroho & Numata, 2020). In the tourism industry, competencies include technical skills, communication, leadership, problem-solving, and other relevant skills (Arifin et al., 2019). Interpersonal skills and teamwork abilities are also crucial for success in this field (Harianto et al., 2023). By understanding these competencies and motivations, we can promote gender equality and sustainable tourism development in Mandalika SEZ. Recent studies have highlighted the significant role of women in the tourism sector, particularly in Indonesia. Syafruddin et al. (2023) found that the tourism industry in Mandalika has created new job opportunities and businesses, with women transitioning from domestic work to the public-professional sector. However, gender inequality persists, necessitating a culturally sensitive development approach to empower women. Similarly, (Arbarini et al., 2019)'s research showed that the 4.0 industrial era offers opportunities for women in tourist village entrepreneurship, improving their economic well-being. Nevertheless, limited access to resources hinders their productivity. Marwah (2019) emphasized the crucial role of women in rural economic development, despite their low political representation. Affirmative inclusion policies and political education are essential to enhance their representation. (Pickel-Chevalier & Yanthy, 2023) found that higher education in tourism empowers women in Balinese society, driving structural changes towards gender equality. However, male support remains crucial, highlighting the gap between administrative rules and community traditions. This research builds upon these studies, focusing on women's empowerment and participation in the tourism sector. It expands on previous findings by exploring women's motivation and competence in Mandalika, a super priority destination (O'Brien et al., 2023).

By adopting a holistic approach, considering education, policy, and community support, this study aims to provide a comprehensive understanding of women's roles in sustainable tourism development in Indonesia (De Cámara et al., 2021). The main difference lies in the focus on Mandalika and the emphasis on women's motivation and competence as key factors in sustainable tourism development. Despite existing research on women's roles in the tourism industry, several knowledge gaps need to be addressed to fully understand the contributions and challenges faced by women in Mandalika.

Firstly, there is a lack of research identifying the factors that influence women's motivation in Mandalika's tourism industry. Secondly, few studies have explored the specific competencies possessed by women in Mandalika in the context of sustainable tourism development, which is essential for designing effective training programs.

Thirdly, research on the relationship between women's participation in tourism and the preservation of local culture in Mandalika is limited, despite women's crucial role in cultural preservation.

Fourthly, empirical evidence supporting the contribution of women's involvement in tourism to local economic growth is lacking. Lastly, there is a lack of research investigating the barriers women face in developing their competencies in Mandalika's tourism sector. This study aims to address these gaps by exploring the motivation and competence of women in Mandalika's tourism industry, identifying factors influencing their work motivation, and evaluating the impact of women's participation on local cultural preservation and economic growth.

The findings will provide a foundation for designing effective training programs to enhance women's roles in sustainable tourism in Mandalika. By investigating these aspects, this research will contribute to a deeper understanding of women's contributions and challenges in Mandalika's tourism industry, ultimately supporting the development of sustainable tourism practices that empower women and preserve local culture.

Conceptual Framework

Independent variables

The independent variables in this study are motivation and competence. Motivation refers to the intrinsic, extrinsic, and social factors that drive women to participate in the tourism industry in Mandalika. Competence refers to the knowledge, skills, and attitudes that women possess to contribute to sustainable tourism development.

Dependent variables

The dependent variables in this study are women's participation in tourism, local cultural preservation,

and economic growth. Women's participation in tourism refers to the extent to which women are involved in the tourism industry in Mandalika. Local cultural preservation refers to the extent to which women's participation in tourism contributes to the preservation of local culture. Economic growth refers to the impact of women's participation in tourism on the local economy.

Moderating variables

The moderating variables in this study are barriers to developing competencies and cultural and social norms. Barriers to developing competencies refer to the obstacles that women face in acquiring the knowledge, skills, and attitudes needed to participate in the tourism industry. Cultural and social norms refer to the values and beliefs that shape women's participation in tourism.

Theoretical Framework

The theoretical framework for this study draws on self-determination theory, competency theory, social exchange theory, and cultural preservation theory. Self-determination theory explains motivation, competency theory explains competence, social exchange theory explains women's participation and economic growth, and cultural preservation theory explains local cultural preservation.

Research Questions

The research questions guiding this study are: (1) What motivates women to participate in the tourism industry in Mandalika?; (2) What competencies do women possess that contribute to sustainable tourism development in Mandalika?; (3) How does women's participation in tourism impact local cultural preservation in Mandalika?; and (4) What is the relationship between women's participation in tourism and economic growth in Mandalika?

Methodology

Research Design

This study employs a mixed-method approach, combining both quantitative and qualitative methods to explore the motivation and competence of women in the tourism sector of Mandalika SEZ. The quantitative approach involves a survey questionnaire distributed to 100 women working in the tourism sector, while the qualitative approach involves in-depth interviews with 10 informants. The survey questionnaire aims to gather data on demographic characteristics, motivations, and competencies, while the in-depth interviews seek to gain a deeper understanding of women's experiences, challenges, and perspectives. The data collection process ensures anonymity and confidentiality to encourage honest responses. The quantitative data are analyzed using statistical software, while the qualitative data are analyzed using thematic analysis. This mixed-method approach provides a comprehensive understanding of the research topic, allowing for triangulation of data and increased validity of findings. (Baggio & Klobas, 2017; Hillman & Radel, 2018).

Study Population

The total population for this study consists of women who work in the tourism sector in Mandalika, Indonesia. According to recent statistics, there are approximately 1,500 women employed in the tourism industry in Mandalika, including hotel staff, tour guides, travel agents, and entrepreneurs.

Sampling

The sample size for this study was determined using G*Power software, a statistical power analysis program. Based on the estimated population size of 1,500 women working in the tourism sector in Mandalika, a minimum sample size of 100 respondents was calculated to achieve a power of 0.8 and a margin of error of 0.1. Respondents were selected based on specific criteria, including being women aged 18-50 years old, currently employed in the tourism sector in Mandalika, having a minimum of 6 months of work experience in the tourism industry, and being able to communicate in Bahasa Indonesia or English. Key informants were selected based on their expertise and experience in the tourism industry in Mandalika. They included tourism industry leaders, hotel managers, local government officials, and academic experts in tourism studies. These individuals had a minimum of 5 years of work experience in the tourism industry and held leadership or managerial positions. The key informants' backgrounds and primary responsibilities included strategic planning and decision-making for tourism development, managing hotel operations and staff, developing and implementing tourism policies, and conducting research and teaching tourism-related courses. Their expertise and experience provided valuable insights into the tourism industry

in Mandalika and informed the development of the study's findings and recommendations. The sample for this study consisted of 100 women working in the tourism sector of Mandalika Special Economic Zone (SEZ), Indonesia. The sample was selected using purposive sampling, a non-probability sampling technique. This technique was chosen to ensure that the sample was representative of the population of women working in the tourism sector in Mandalika SEZ.

Data Collection

Data were collected through a mixed-method approach, combining both quantitative and qualitative methods. A self-administered survey questionnaire was distributed to 100 women working in the tourism sector of Mandalika SEZ, consisting of 30 questions that explored demographic characteristics, motivations, and competencies. The survey questionnaires were distributed over a period of two weeks, and respondents were given one week to complete and return the questionnaires. In addition to the survey, in-depth interviews were conducted with 10 informants, selected through purposive sampling. The interviews were conducted in a private setting, and each interview lasted approximately 60 minutes. An interview guide was used to ensure consistency and comprehensiveness of data collection, consisting of 15 open-ended questions that explored women's experiences, challenges, and perspectives. The in-depth interviews were conducted over a period of three weeks, and each interview was audio-recorded and transcribed verbatim. To ensure data quality, the survey questionnaire and interview guide were pre-tested with a small group of women working in the tourism sector to ensure clarity and relevance of questions. A pilot study was also conducted with 10 women to test the data collection instruments and procedures. Data were validated through triangulation, where quantitative and qualitative data were compared and contrasted to ensure consistency and accuracy.

Data Collection Procedure

The data collection procedure involved several steps to ensure the collection of high-quality data. First, the survey questionnaire was distributed to 100 women working in the tourism sector of Mandalika SEZ through a combination of online and offline methods. The online method involved sending the questionnaire via email and social media platforms while the offline method involved distributing hard copies of the questionnaire in person. Once the questionnaires were distributed, respondents were given one week to complete and return the questionnaires. Reminders were sent to respondents who had not returned the questionnaires after one week to encourage participation. For the in-depth interviews, informants were selected through purposive sampling and contacted via phone or email to schedule an interview. On the day of the interview, the informant was briefed on the purpose and scope of the study, and informed consent was obtained. The interview was then conducted in a private setting, and each interview lasted approximately 60 minutes. The interviews were audio-recorded and transcribed verbatim to ensure accuracy and completeness. Throughout the data collection process, the researcher maintained a record of responses, including dates and times of data collection, to ensure that all respondents had an equal opportunity to participate. The researcher also ensured that all data were collected in a secure and confidential manner to protect the privacy of respondents.

Data Analysis

The collected data were analyzed using a combination of quantitative and qualitative methods. Quantitative data from the survey questionnaires were analyzed using statistical software, IBM SPSS Statistics (Version 28.0; IBM Corp., Armonk, NY), including descriptive statistics, inferential statistics, correlation analysis, regression analysis, and factor analysis. This helped identify patterns, trends, and correlations within the data. Qualitative data from the in-depth interviews were analyzed using thematic analysis, where transcripts were coded and categorized to identify emerging themes and sub-themes. This provided a rich understanding of the experiences, challenges, and perspectives of women in the tourism sector. Triangulation was used to validate the findings by comparing and contrasting the results from both quantitative and qualitative data. This ensured a comprehensive understanding of the research topic and increased the reliability of the findings. The data analysis aimed to answer the research questions, identify relationships between variables, and provide insights into the motivation and competence of women in the tourism sector of Mandalika SEZ. (Gray et al., 2007).

Statistical Analysis

The quantitative data collected through the survey questionnaire were analyzed usingstatistical software (SPSS) to uncover patterns, trends, and correlations. Descriptive statistics, such as means, standard deviations,

and frequencies, were calculated to summarize the demographic characteristics and experiences of the respondents. Inferential statistics, including *t*-tests and ANOVA, were employed to compare the means of different groups, like age and job position, to identify significant differences. Correlation analysis, using Pearson's correlation coefficient, examined the relationships between variables, such as motivation and competence. Linear regression modeled the relationship between independent variables (motivation, competence) and dependent variables (job satisfaction, career advancement). Finally, exploratory factor analysis identified underlying factors that explain the relationships between variables. By applying these statistical techniques, the analysis provided insights into the motivation and competence of women in the tourism sector of Mandalika SEZ.

The IOC test was conducted to assess the extent to which each item aligned with the research objectives. The results showed that all items had a high level of congruence, with a minimum IOC score of 0.8. Specifically: - The motivation scale had a Cronbach's Alpha coefficient of .88 and an IOC score of 0.9. - The competence scale had a Cronbach's Alpha coefficient of .83 and an IOC score of 0.85. - The participation scale had a Cronbach's Alpha coefficient of .87 and an IOC score of 0.9.

Results

This research reveals that women's motivations and work competencies in tourism in the Mandalika SEZ Super Priority Destination fall into four main categories: self-actualization, family support, economic encouragement, and employment opportunities.

Table 1 presents the demographic characteristics of the 100 respondents who participated in the survey. The table shows the frequency and percentage of respondents by age group, education level, and other relevant demographic variables.

Table 2 presents the mean scores and standard deviations of the motivation factors that influence women's participation in the tourism sector. The table shows the level of importance respondents assigned to each motivation factor, such as personal interest, career advancement, and financial benefits.

Table 3 presents the mean scores and standard deviations of the competence areas that are essential for women's participation in the tourism sector. The table shows the level of competence respondents reported in areas such as communication skills, leadership skills, and problem-solving skills.

Table 4 presents the level of participation of women in the tourism sector. The table shows the frequency and percentage of respondents who reported high, medium, or low levels of participation.

Table 5 presents the results from the key informant interviews. The table shows the frequency and percentage of themes mentioned by the key informants, such as motivation factors, competence areas, and participation levels. The key informants provided in-depth insights into the factors that influence women's participation in the tourism sector as shown in Table 6.

Table 1 Demographic characteristics of respondents (n = 100)

Characteristic	Frequency	%
Age		
18-25	25	25
26-35	30	30
36-45	20	20
46-55	15	15
Above 55	10	10
Education		
High school	20	20
Diploma	30	30
Bachelor's degree	40	40
Master's degree	10	10

Table 2 Motivation factors (n = 100)

Motivation factor	Mean	Standard deviation
Personal interest	4.1	4.9
Career advancement	3.9	0.8
Financial benefits	3.7	0.7

Table 3 Competence areas (n = 100)

Competence area	Mean	Standard deviation
Communication skills	4.2	0.8
Leadership skills	3.9	0.7
Problem-solving skills	3.8	0.6

Table 4 Participation levels (n = 100)

Participation level	Mean	Standard deviation
High participation	40	40%
Medium participation	30	30%
Low participation	30	30%

Table 5 Results from key informants (n = 10)

Theme	Frequency	%
Personal interest	8	80
Career advancement	6	60
Financial benefits	4	40
Communication skills	9	90
Leadership skills	7	70
Problem-solving skills	6	60

Table 6 Motivation and competence of women in the tourism sector in Mandalika SEZ

No.	Category	Finding	Quote
1	Self-actualization	Relevant educational background motivates women to work in tourism.	"Because my background was English, I found it easy to get a job..." (informant 4)
		Satisfaction in sharing knowledge with others.	"Sharing knowledge with others gives me satisfaction..."
		Tourism work is seen as a calling, not just a livelihood.	"Working in tourism is my calling..."
2	Family support	Family support is crucial for women's career in tourism.	"Supported by my husband, we rented a place..." (informant 2)
		Concrete help from family in building a business.	"My husband, who also works in tourism, helps build networks..."
3	Economic drive	Tourism income helps meet household needs.	"Income from tourism helps meet various needs..."
		Tourism income supports children's education and household expenses.	"Tourism income supports my children's education and household expenses..."
		Tourism provides opportunities for women to start businesses.	"Tourism provides opportunities for women to start businesses..."
		Tips from tourists as a form of appreciation and motivation.	"Tips from tourists are a form of appreciation..." (informant 7)
4	Job opportunities	Job opportunities through social and professional networks.	"A friend suggested, 'Why not try guiding?'..." (informant 8)
		Inclusive work environment without gender discrimination.	"No gender discrimination in the workplace..."
		No significant gender discrimination experienced at the workplace.	"Gender does not significantly affect career progression..."

Source: Data processed by the author in 2024

The comparison shows that (Table 7): Both respondents and key informants identify self-actualization as the primary motivator for women in the tourism sector. However, there are some differences in their perspectives on essential competencies. Key informants place more emphasis on communication skills and leadership skills, while respondents also highlight problem-solving skills and adaptability as crucial. Despite these differences, respondents and key informants share similar views on the importance of family support and economic drive as motivators. Notably, respondents see job opportunities as a more significant motivator than key informants do. This comparison highlights the similarities and differences in perspectives between the 100 respondents and the 10 key informants, providing a more comprehensive understanding of the motivation and competence of women in the tourism sector.

Motivation Factors for Women in the Tourism Sector

Self-actualization

Women working in the tourism sector in Mandalika SEZ feel satisfied with their contributions, both in terms of skills and knowledge sharing. Informants stated that educational background and foreign language proficiency are important motivating factors for them. For instance, one informant with an English education background found it easier to secure a job in this sector. Additionally, the satisfaction of sharing knowledge with others is also a significant motivation for female workers.

Table 7 Compare the indicators of motivation and competence of women in tourism sector from 100 respondents' perspectives and 10 key informant's perspectives

Motivation	Respondents (n = 100):	Key Informants (n = 10):
Motivation	- Self-actualization (85%)	- Self-actualization (90%)
	- Family support (78%)	- Family support (80%)
	- Economic drive (75%)	- Economic drive (70%)
	- Job opportunities (70%)	- Job opportunities (60%)
Competence	Respondents (n = 100):	Key Informants (n = 10):
Competence	- Communication skills (80%)	- Communication skills (95%)
	- Leadership skills (75%)	- Leadership skills (85%)
	- Problem-solving skills (70%)	- Problem-solving skills (80%)
	- Adaptability (65%)	- Adaptability (75%)

Family support

Family support has proven to be an important factor influencing women's involvement in the tourism sector of Mandalika SEZ. This support is not only in the form of permission to work but also concrete assistance in starting and developing businesses. Support from spouses or other family members provides confidence and stability for women to pursue careers in tourism.

Economic drive

Economic drive is also a primary motivation, with income from the tourism sector helping to meet household needs and improve family living standards. Earnings that can exceed 10 million rupiah per month highlight the significant economic potential of this sector for women.

Job opportunities

The study's findings also show that job opportunities in the Mandalika tourism sector are widely available to women, especially through social and professional networks. Informants stated that friendships and acquaintances are very helpful in securing job opportunities. Furthermore, the tourism sector in Mandalika tends to be inclusive and non-discriminatory regarding gender, allowing women to pursue careers without facing discrimination.

Perception of Gender Equality in the Workplace

The visual data analysis indicates a predominantly positive perception of gender equality in the workplace within the tourism sector of KEK Mandalika, with 90 percent of respondents reporting no gender discrimination. However, there remains a notable divide regarding gender's influence on career advancement, as 47.8 percent of respondents believe gender affects their career progression, while 52.2 percent do not see it as a significant factor (Figure 1).

Women's Competence in the Tourism Sector

Women workers in the Mandalika tourism sector exhibit a positive attitude towards their work, with high motivation to continuously learn and improve their skills. The ability to build networks and good communication skills greatly support their success. Dedication and courage to start a business are also characteristic of women in the Mandalika tourism sector.

Key Competencies

Women's competence in the tourism sector of the Mandalika SEZ can be divided into four categories: attitude towards contribution, skills, commitment, and knowledge. Their attitudes and skills greatly support their contributions to this industry. A love for their work and a willingness to keep learning are the main drivers that enable them to face challenges in the tourism sector.

Communication Skills

Good communication skills, both in local and foreign languages, and the ability to build networks are key elements of women's competence in this sector. Informants indicated that friendships and acquaintances not only open new business opportunities but also aid in the smooth operation of their enterprises. Communication skills also help in providing the best service to tourists and building closer relationships.

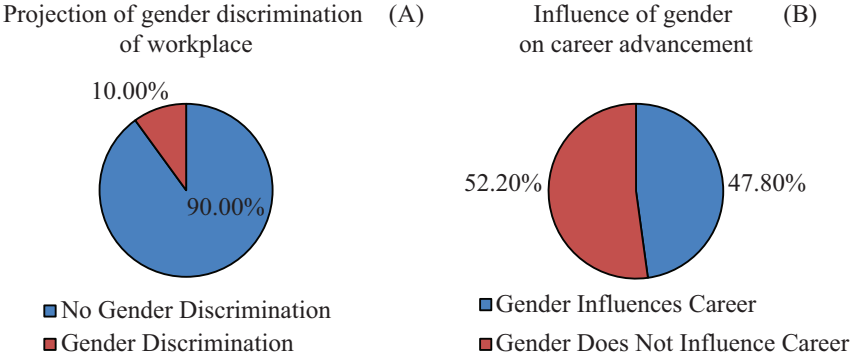

Figure 1 Influence of gender on career advancement; (A) Projection of gender discrimination of workplace, and (B) Influence of gender on career advancement
Source: Data processed in 2024

Discussion

Motivation

To enhance women's motivation in the tourism sector, governments and tourism organizations should provide training and development programs that focus on self-actualization and family support. Economic incentives and support systems should be established to encourage women to start their own tourism businesses. Additionally, job opportunities and career advancement programs should be created to attract and retain women in the tourism sector.

Competence

To enhance women's competence in the tourism sector, governments and tourism organizations should provide training and development programs that focus on communication skills, leadership skills, problem-solving skills, and adaptability. Mentorship programs should be established to pair women with experienced professionals in the tourism industry. Furthermore, technology training programs should be provided to enhance women's technology skills and competitiveness in the tourism sector.

Overall

To support the development of women in the tourism sector, governments and tourism organizations should prioritize gender equality and women's empowerment. Policies and programs should be developed to address the unique challenges and barriers faced by women in the tourism sector. Collaboration and partnerships between governments, tourism organizations, and women's groups should be fostered to support the development of women in the tourism sector.

Women's Commitment and Dedication

Strong commitment to delivering the best is also evident from the women's courage to start businesses and work wholeheartedly. Despite often facing constraints in capital and knowledge, they do not hesitate to take the first step. Their dedication and hard work are reflected in the services they provide to tourists, even in challenging working conditions.

Knowledge and Innovation

Knowledge is also a crucial aspect of women's contributions in the tourism sector of the Mandalika SEZ. They actively participate in training to enhance their skills and knowledge and conduct analyses of their surroundings to support informed decision-making. Their expertise in identifying business opportunities and courage to try new things show that women in this sector have a strong foundation for innovation.

Contributions to Sustainable Tourism Development

This research shows that women in the tourism sector of the Mandalika SEZ have strong motivation and competence to contribute to sustainable tourism development. Family support, economic opportunities, and inclusive job opportunities are the main motivating factors for them. Positive attitudes, good skills, high commitment, and continually enhanced knowledge are the main assets for women to succeed and contribute significantly to this sector.

Research Implications

The findings of this research highlight the importance of supporting and empowering women in the tourism industry to achieve sustainable development. This research addresses the gaps in existing literature, including the lack of studies on women's motivation in the tourism industry, the specific competencies possessed by women in Mandalika, the relationship between women's participation and the preservation of local culture, the economic contributions of women, and the barriers faced by women in developing their competencies. This research makes significant contributions to the existing literature by expanding our understanding of women's motivation, competence, and contributions in the Mandalika tourism industry. The findings highlight the importance of empowering women through targeted training programs, inclusive work environments, and strong family support. The study opens up avenues for further research on how to integrate these aspects into sustainable tourism development policies and practices. By addressing existing gaps and providing a solid foundation for further development, this research sets the stage for future studies.

Conclusion

This research reveals that women in the tourism sector of Mandalika SEZ are motivated by self-actualization, family support, economic drive, and job opportunities. They exhibit high job satisfaction, leveraging their skills and knowledge to contribute meaningfully, with educational background and foreign language proficiency being key factors. Family support plays a crucial role in strengthening their careers, providing both permission and concrete assistance in starting businesses. Moreover, income from tourism not only meets household needs but also improves family living standards and enables women to start businesses. Theoretically, this research enriches the literature on women's participation in the tourism sector, highlighting the significance of family support and economic opportunities as key motivators. Practically, the findings provide guidance for policymakers to develop strategies for empowering women in the tourism sector by creating an inclusive work environment and offering relevant training. However, this research has limitations, as the sample is restricted to one tourism destination. Future research should aim to encompass a broader area and consider additional variables, such as the impact of digital technology on women's participation in the tourism sector.

Conflicts of Interest

The authors declare that there is no conflicts of interest.

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Review Article

A critical review of processing mechanisms and moderating factors in L2 conceptual metaphor comprehension

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Abstract

Metaphors are fundamental to human cognition and language but present significant challenges for second language (L2) learners due to the unpredictability of figurative meanings and the cognitive demands required for processing. While much research has focused on metaphor comprehension in first-language contexts, there is still limited understanding of the specific difficulties faced by L2 learners. This review examines the mechanisms and factors that influence L2 metaphor comprehension, emphasizing their limitations in forming a comprehensive picture of how learners' strategies, conceptual transfers, and neural processes interact. Critical issues include processing mechanism inconsistencies and research methodology inadequacies, particularly the lack of cross-linguistic analysis and insufficient data triangulation. Our findings address the need for cross-linguistic interdisciplinary approaches, improved research designs, and methodological triangulation to capture the complexity of L2 metaphor comprehension more accurately. This review offers directions for advancing future research to develop a more comprehensive understanding of how cognitive and linguistic elements interact in L2 metaphor comprehension.

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Introduction

Metaphor is a pervasive cognitive and linguistic phenomenon that functions as a fundamental mode of cognition, enabling individuals to understand abstract concepts through the mapping of more concrete experiences (Lakoff & Johnson, 1980). For example, in the conceptual metaphor *ARGUMENT IS WAR*, the structure of physical conflict is used to conceptualize and articulate the abstract domain of argumentation, leading to expressions such as "defend a position" or "attack an argument." Conceptual metaphors arise from the interaction between embodied experiences and contextual factors, making them fundamental cognitive tools for organizing abstract concepts (Kövecses, 2015).

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In the 1980s, the study of metaphor entered the cognitive category and started to be incorporated into the research of second language or foreign language learning. As Lakoff and Turner (1989) pointed out, metaphors are conventional to native speakers yet may seem novel to second language (L2) learners. They pose specific problems with language learning for all groups of learners due to the unpredictability of the figurative meaning. Compared with native speakers, more cognitive resources will be engaged for L2 learners during processing due to their unfamiliarity with L2 metaphorical expressions. Moreover, L2 learners generally lack the relevant L2 culture and conceptual system, coupled with the limitations of their L2 proficiency and the transfer of first language (L1) culture, leading to challenges for L2 learners to encode conceptual information and interpret L2 metaphors (Danesi, 2000; Deignan et al., 1997). Thus, understanding and processing L2 metaphors requires additional cognitive effort and cultural knowledge, making it a particularly challenging aspect of second language acquisition.

Over the past three decades, research on metaphor processing has become a prominent focus within metaphor studies, leading to the development of several distinct explanatory models. Both *Conceptual Metaphor Theory* (Lakoff & Johnson, 1980) and *Structure Mapping Theory* (Wolff & Gentner, 2011) involve directional projection, where conceptual metaphors are mapped from one domain to another. However, *Conceptual Metaphor Theory* focuses on mappings through embodied experience, while *Structure Mapping Theory* emphasizes the alignment of abstract structural relationships and the alignment of relational patterns rather than sensory grounding. *Relevance Theory* (Sperber & Wilson, 2008) critiques these projection models by arguing that metaphors rely more on contextual inference than fixed mappings, particularly in cases involving nonverbal modalities. For instance, in the metaphor "I felt his glance," there is no direct physical sensation, yet the metaphor evokes a sensory experience, challenging the notion that all metaphors rely on physical embodiment or structural projection. While *Relevance Theory* posits the role of linguistic and contextual cues in constructing broader, context-specific "ad hoc" concepts beyond the literal meanings, it overlooks creativity and novelty in using metaphors, viewing them mainly as tools for efficiency and relevance.

Another renowned model, the *Class-inclusion Model* (Glucksberg & Keysar, 1990) proposes a symmetric mechanism where metaphors assign source and target domains to a shared category and match their features. In the example "My job is a jail", rather than mapping characteristics from "jail" to "job," the model suggests both are matched within the broader category of "unpleasant, confining situations," with the metaphor operating through category inclusion rather than direct mapping. By combining mapping and matching mechanisms, the *Career of Metaphor Theory* (Bowdle & Gentner, 2005) proposes that the processing of conventional metaphors is mainly based on the *Class-inclusion Model*, while the processing of novel metaphors is mainly done through structural mapping. The *Graded Salience Hypothesis* (Giora, 1997) claims that matching concepts is not required; instead, the key to interpreting a metaphor lies in the salience degree of the word's meaning. Regardless of whether the context is appropriate, the salient meaning is automatically extracted and accessed directly in the lexical entries and modified if it does not match the context.

While the previous models differ in whether metaphors are processed through directional projection, symmetric matching, or salience in the mental lexicon, they all assume that metaphors, especially conventional metaphors, are deeply embedded in the mental lexicon, enabling automatic and unconscious processing. However, the background knowledge of embodied experience from a target language could be an additional requirement for L2 learners. Consequently, these models are more applicable to L1 learners but may be less functional with L2 learners, who typically lack common knowledge of necessary source and target domains in the L2.

Based on the implications of existing metaphor processing theories, scholars have recognized the limitations in accounting for L2 metaphor processing. While L1 models of metaphor processing reflect holistic and automated processing, L2 learners often find metaphors, even conventional ones, challenging. This difficulty leads L2 learners to adopt more analytical, non-automated processing modes, which involve breaking metaphors into smaller components. L2 learners can gradually combine the metaphor's meaning by analysing individual elements and relying on contextual cues. Over the past two decades, L2-specific models have emerged to better account for these challenges. These models focus on the processing mechanisms involved in L2 metaphor comprehension, referring to the concept-encoding processes that L2 learners automatically initiate to attribute semantic features to the tenor of a metaphor (Banaruee et al., 2019). However, these mechanisms are further influenced by various factors, such as L2 proficiency, linguistic and cultural knowledge, and context, which shape the effectiveness of metaphor comprehension.

Despite the emerging L2-specific models, very few studies have comprehensively synthesized and critically evaluated them within the scope of conceptual metaphors. This review aims to examine the mechanisms proposed in these models, examining their strengths, limitations, and practical implications. Additionally, it analyses how moderating factors contribute to the unique challenges faced by L2 learners. By identifying gaps in current research, this paper provides a comprehensive review of existing processing mechanisms and moderating factors, offering implications for future research in L2 figurative language processing and bridging the gap between existing L1 and L2 studies to uncover how cognitive and linguistic processes impact metaphor comprehension.

Methodology

This critical study synthesizes findings from an extensive review of research investigating processing mechanisms and key factors in L2 metaphor comprehension. The methodology has been adapted from established procedures in literature review research (Boote & Beile, 2005; Hart, 2025; Tranfield et al., 2003; Webster & Watson, 2002), ensuring a rigorous and systematic approach. These scholars emphasize the importance of conducting a comprehensive and inclusive literature search, applying well-defined selection criteria, and performing both thematic analysis and critical evaluation of the reviewed studies. The following steps were undertaken:

Step 1: Literature Search

A thorough search was conducted across major academic databases, including Scopus, WOS, and JSTOR, as well as Chinese databases, such as CNKI and Wanfang. Following Hart (2025) guidelines on conducting systematic searches, keywords like "L2 metaphor processing," "figurative language comprehension," and "cognitive processes in L2 comprehension" were used to ensure a broad inclusion of both foundational and contemporary studies. This process enabled the identification of diverse, relevant research for analysis, capturing global and regional perspectives essential for thoroughly synthesizing of L2 metaphor comprehension.

Step 2: Selection Criteria

Boote and Beile (2005) emphasis on defining clear selection criteria guided the division of the literature into two main parts: (1) foundational theories in figurative language processing and (2) more recent studies (within the last 15 years) that contain empirical data or influential models related explicitly to L2 metaphor comprehension. This selection ensured that only pertinent and high-quality sources were included in the review.

Step 3: Thematic Analysis

Adapted from Hart (2025) and Webster and Wason (2002) approach to literature synthesis, thematic analysis was conducted to interpret and summarize the primary content and arguments of the selected studies. Critical models in L2 metaphor comprehension were analysed, with patterns and recurring themes identified across the literature. This process enabled a deeper understanding of how these elements contribute to L2 metaphor comprehension, following Boote and Beile (2005) emphasis on synthesizing and integrating theoretical and empirical insights.

Step 4: Critical Evaluation

In alignment with Boote and Beile (2005) emphasis on evaluating the quality of research, close reading was employed to critically assess the methodologies, findings, and implications of existing research. This included a critical examination of the robustness of study designs, the validity of conclusions drawn, and any potential biases. This method allowed for a nuanced understanding of how different studies approach L2 metaphor comprehension and the cognitive mechanisms involved.

Results

Following the literature review of L2 metaphor processing models, recurring themes and patterns were synthesized to identify the core factors and mechanisms revealed in L2 metaphor comprehension.

Factors Moderating L2 Metaphor Comprehension

One of the major criticisms of *Conceptual Metaphor Theory* (Lakoff & Johnson, 1980) is its limited consideration of context in metaphor comprehension. While *Conceptual Metaphor Theory* emphasizes pre-stored, universal mappings between source and target domains, critics argue that metaphors are dynamically shaped by the immediate discourse and broader situational context (Kövecses, 2015). Early research on L2 metaphor comprehension has extensively examined the factors moderating L2 learners' comprehension, with context consistently identified as a pivotal factor. Metaphor processing involves inference-making based on boarder context and semantic analysis, aligning with *Semantic-context Effects*

(Tulving & Gold, 1963). Context helps disambiguate metaphors by promoting the perception of contextually congruent words and inhibiting incongruent ones. Even minimal context supports the correct interpretation of figurative expressions through necessary semantic information (Gildea & Glucksberg, 1983). Relevant context facilitates the differentiation of figurative and literal meanings, enhancing comprehension, particularly for unfamiliar phrases. With sufficient context, metaphors can be processed as quickly as literal statements (Bowdle & Gentner, 2005). Additionally, Türker (2016) demonstrates that the effects of L1 conceptual/linguistic knowledge and L1 frequency vary with context. Consequently, most studies (Xu, 2014; Wu et al., 2021) consider the role of context, embedding metaphorical expressions in a one- or two-sentence context as research instruments. Regarding the configuration of context in facilitating comprehension, Shu (2000) suggests that metaphor comprehension begins with identifying metaphors through explicit signals or semantic-contextual conflicts, followed by inferring meaning based on the tenor and vehicle, with the quantity and quality of contextual information and the listener's knowledge structure significantly influencing the process.

Carrol and Littlemore (2020) argue that while context aids sensory selection, transparency is crucial for generating new senses. High transparency enhances memory retention of figurative language, improving L2 comprehension (Hubers et al., 2020). While transparent figurative languages are generally viewed as more decomposable, transparency and decomposability are distinct concepts, facilitating L2 figurative language comprehension (Carrol & Littlemore, 2020). Decomposability refers to the extent to which individual components independently contribute to the overall figurative interpretation (Gibbs et al., 1989). Higher decomposability improves meaning identification (Carrol & Littlemore, 2020). For example, in the Chinese metaphor 耳边风 (ěr biān fēng, "a puff of wind past the ear"), the components — 耳 (ěr, "ear"), 边 (biān, "beside"), and 风 (fēng, "wind") independently contribute to its figurative meaning of unheeded advice, making the metaphor more decomposable and earlier to interpret.

Familiarity, or conventionality, is a crucial predictor in measuring the frequency of figurative expressions (Thibodeau & Durgin, 2011). Bowdle and Gentner (2005) note that novel metaphors require comparison and analysis, while conventional metaphors are categorized. High familiarity leads to rapid metaphor processing, aided by prior experience, which reduces viable interpretations and strengthens semantic connections (Blasko & Connine, 1993). Consequently, conventional, high-familiar metaphors are processed more quickly and easily than novel ones (Giora, 1997). Therefore, familiarity is included in the screening criteria for developing experimental stimuli (Wang, 2018). Additionally, aptness also plays a crucial role in determining the speed and ease of metaphor processing, with research showing conflicting results. Damerall and Kellogg (2016) argue that familiarity alone drives metaphor processing, while Blasko and Connine (1993) find that high-familiarity metaphors are less affected by aptness than less familiar ones. Thibodeau and Durgin (2011) demonstrate that conventionalizing a metaphor speeds processing, whereas differently priming it reduces its aptness rating. Aptness, describing how well a metaphor's vehicle captures its tenor, influences metaphor-sentence quality but primarily measures perceived processing fluency (Tourangeau & Sternberg, 1981).

To summarize, sentence context, transparency, decomposability, familiarity, and aptness have been empirically identified to affect L2 metaphor comprehension. With the roles of context and familiarity being addressed in developing experimental stimuli, other dimensions have not been comprehensively elucidated in the screening criteria or incorporated as moderator variables in metaphor processing studies. This oversight threatens the external validity and generalizability of existing findings. For example, in Wu et al. (2021) study, the metaphor — 火热 (huǒrè, "fiery, intense") — was given to both Thai and Malay learners of Chinese. However, it might be understood differently by Thai and Malay learners of Chinese due to differences in direct translations and cultural connotations. In Thai, 火热 translates to ร้อนแรง (ron raeng, "fiery, intense"), which retains a similar metaphorical meaning, while in Malay, the direct translation *hangat* (warn) or *bersemangat* (full of energy) may not fully capture the same nuance. To address these discrepancies, a transparency rating test should be conducted when developing stimuli to ensure metaphorical expressions are appropriately understood across different linguistic and cultural backgrounds.

Mechanisms Revealed from L2 Metaphor Comprehension

The processing mechanisms involved in L2 metaphor comprehension encompass interconnected cognitive and linguistic processes that collectively facilitate comprehension. In this review, strategy use, conceptual transfer, and neurological activity emerge as integral components of the broader mechanism driving L2

metaphor comprehension. Strategy use refers to the methods learners adopt for interpreting metaphors, while conceptual transfer involves the application of L1 knowledge to L2 metaphor understanding. Neurological activity provides insight into the real-time cognitive processes underlying metaphor comprehension.

Strategy use in L2 metaphor comprehension

Strategy use plays a crucial role in L2 metaphor comprehension, providing learners with cognitive tools to navigate the complexities of metaphor interpretation. Specifically, sentence context and literal meaning assist learners in deciphering metaphorical meaning by drawing on contextual cues or translating metaphors directly from L2 to L1 (Wu et al., 2021; Xu, 2014). While sentence context helps infer metaphorical meaning through surrounding text, literal translation can lead to misinterpretation when metaphorical meanings significantly diverge from their literal counterparts. Linguistic and cultural knowledge from both L1 and L2 serve as essential knowledge resources for learners in metaphor comprehension, referred to as L1 and L2 knowledge. In studies exploring strategy use in L2 metaphor comprehension, learners commonly draw on these knowledge sources, though their effectiveness and frequency of use vary. Su and Chen (2020) found that while L1 knowledge is a secondary strategy, it remains effective in aiding metaphor comprehension. Xu (2014) observed that higher-proficiency learners rely more on L2 knowledge, whereas lower-proficiency learners often depend on L1 knowledge, albeit with less accuracy. Similarly, Wu et al. (2021) demonstrated that although using L1 and L2 knowledge resulted in 100 percent accuracy, the low frequency of their use limited the validation of these strategies' overall effectiveness.

Strategies do more than just aid in processing; they directly impact metaphor comprehension by enabling learners to handle linguistic and conceptual challenges. For example, when learners encounter unfamiliar metaphors, they may rely on strategies like psychological imagery, syntactic analysis, or random guessing to compensate for knowledge gaps and low L2 proficiency (Li et al., 2019; Wu et al., 2021). Moreover, lexical interpretation strategies, particularly for Chinese L2 learners, allow learners to access metaphorical meaning, through the semantic components of Chinese characters (Wu et al., 2021). These strategies help learners move beyond literal interpretation, facilitating deeper comprehension of metaphorical expressions.

Despite extensive research on strategy use, few studies have established a comprehensive model for L2 metaphor comprehension. Xu and Wang (2014) examined metaphor comprehension strategies employed by Chinese EFL learners, who provided written explanations of their reasoning. The study identified several strategies: sentence context, literal translation, Chinese knowledge, English knowledge, random guess, psychological imagery, and syntactic analysis. The strategies revealed a multi-stage cognitive process in L2 metaphor comprehension: (1) initial literal interpretation based on the L2 lexical form, (2) recognition of a mismatch between literal meaning and sentence context, (3) association with L1 culture concepts, (4) projection of L1 concept onto L2 context, and (5) facilitation or hindrance of comprehension depending on concept alignment. Although learners start with literal processing, strategies are activated only when a conflict between literal meaning and context arises, prompting a shift to more analytical strategies to resolve the metaphorical meaning. This analytical approach led to the development of the *Analytical Model for Metaphor Comprehension* (See Figure 1), pioneeringly reflecting the role of literal processing, sentence context, and strategy uses. However, the written response format oversimplifies documentation of strategy patterns, such as a sequence of strategy deployment, and without tracking processing pathways, it fails to capture how these strategies interact to achieve L2 metaphor comprehension.

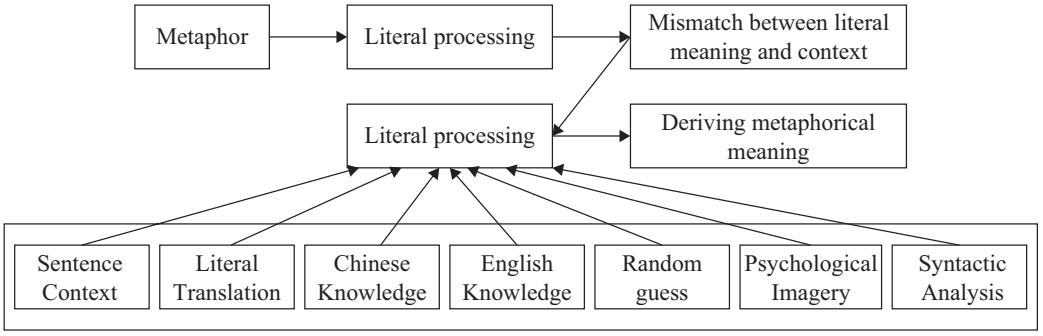

Figure 1 The analytical model for metaphor comprehension (Xu & Wang, 2014)

Conceptual transfer in metaphor processing

In cognitive linguistics, conceptual transfers are the main focus in studies of L2 metaphor processing. This section primarily focuses on conceptual transfer in L2 processing, exploring how pre-existing metaphorical schemas in L1 influence the acquisition and comprehension of metaphors in L2. *Conceptual Transfer Theory*, first proposed by Odlin (1989), posits that language acquisition influences cognition, affecting the understanding and use of new languages, with L1 impacting L2 at cognitive and linguistic intersections (Jarvis & Pavlenko, 2007).

Metaphorical transfer is the application of *Conceptual Transfer Theory* to L2 metaphor processing, highlighting how pre-existing metaphorical schemas in L1 affect the acquisition and use of metaphors in L2 (Jarvis & Pavlenko, 2007). During the metaphorical transfer, information is translated between the source and target domains, involving complexity due to the asynchronous levels of the conceptual basis (CB) and linguistic form (LF) (Charteris-Black, 2002). Cross-cultural differences in conceptual systems lead to varying comprehension of conceptual metaphors (Lakoff & Johnson, 1980), reflected in the differences in LFs. Thus, metaphorical transfer entails correspondence between LF and CB. Danesi (2000) proposed three transfer modes: (1) The L1 concept results in positive transfer when the LF and CB of L1 and L2 are equivalent; (2) the L1 concept produces negative transfer when L1 and L2 share the equivalent LF but different CB; and (3) the transfer has a dual effect when the LF of L1 and L2 partly overlap.

Metaphorical transfer is analysed through metaphorical tests, which serve as primary stimuli for eliciting L2 learners' reports on metaphor processing. However, studies (Li et al., 2019; Wu et al., 2021) typically lack systematic classification criteria for the correspondence between learners' native language and the target language in stimuli selection, affecting test validity. Deignan et al. (1997) contrastive analysis model provides valuable insights by combining contrastive and cognitive-linguistic approaches. This model identifies four possible correspondences in L2 learners' metaphorical transfer: (1) equivalent CB and equivalent LF, (2) equivalent CB and different LFs, (3) different CBs, and (4) equivalent LF but different metaphorical meaning. Charteris-Black (2002) refined this model by addressing cultural individuality and generality, providing a more precise model for analysing metaphorical transfer across languages (see Table 1). However, assessing cultural generality based on whether the knowledge basis is culturally neutral lacks specificity and may be perceived as subjective and biased, particularly when comparing languages with many commonalities.

Charteris-Black (2002) categorized figurative expressions into six types based on their relationships in English and Malay and used a multiple-choice test to examine L2 learners' metaphor comprehension difficulties. The results indicated that metaphors with equivalent CB and LF between L1 and L2 were easiest to comprehend, while those with equivalent LF but different CB were most difficult. Additionally, metaphors with transparent cultural references were more accessible to comprehend than those with opaque cultural meanings. Charteris-Black's revised contrastive model was applied to design metaphorical items to measure metaphoricity proficiency. Similarly, Zibin (2016) adopted a multiple-choice test to assess Jordanian EFL learners' metaphor comprehension by applying all six types of the contrastive model to compare English and Arabic metaphors, supporting Charteris-Black's findings. Xu (2014) also used contrastive models to classify English metaphors and assessed Chinese learners' comprehension, examining how proficiency influenced their strategy use, with participants providing written explanations of their interpretations. Using both isolated and contextualized metaphors, Türker (2016) explored how L1 conceptual and linguistic knowledge and context influence L2 figurative expression comprehension, finding that learners performed better when L1 and L2 were conceptually and linguistically analogous in minimal or no context situations. However, both Xu and Türker used only the first four types of the contrastive model, overlooking cultural contrasts between native language and target language.

Table 1 Contrastive model of figurative units (Charteris-Black, 2002)

	Category	Linguistic form	Conceptual basis
Type 1	ones with an equivalent CB and an equivalent LF	=	=
Type 2	ones with an equivalent CB and a similar LF	~	=
Type 3	ones with a different CB but an equivalent LF	=	#
Type 4	ones with an equivalent CB but a different LF	#	=
Type 5	ones with a different CB (cultural-transparent) and a different LF	#	#+transparent
Type 6	ones with a different CB (cultural-opaque) and a different LF	#	#+opaque

Note: * = equivalent; # different; ~ similar

Building on previous models of bilingual conceptual representation models with findings on types of metaphorical concept representation schemas, Xu (2014) proposed the *Developmental Model of Metaphorical-conceptual Representation*, which explains the relationship between the development of metaphorical-conceptual representations and the improvement of learners' foreign language proficiency.

As shown in Figure 2, the *Developmental Model of Metaphorical-conceptual Representation* posits two input channels for bilinguals: L1 and L2. For low-proficiency L2 learners, lexical connections between the L1 and L2 are predominant. The L1 lexicon strongly connects to L1-specific and shared metaphorical concepts, while the L2 lexicon weakly connects to L2-specific concepts. L1 transfer occurs when the L2 lexicon maps to L1-specific concepts, leading to L1 positive transfer with shared concepts. Similarly, L2 transfer occurs when the L1 lexicon maps to L2-specific concepts, contributing to the L2 positive transfer when mapped to shared metaphorical concepts. However, due to the low proficiency of L2 learners, the positive transfer is relatively weak, while the negative transfer effect is more significant. As language proficiency improves, L2 learners restructure concepts, strengthening L2 lexicon connections and increasing L2 positive transfers. L1-L2 lexical connections always exist, with L1 to L2 connections being stronger. This model depicts conceptual transfers in L2 metaphor processing by highlighting the connections between L1 and L2 lexicons and metaphorical concepts. However, it fails to account for the interplay of multiple factors such as context, cultural familiarity, and individual cognitive strategies, lacking the comprehensive detail needed to fully explain the complexity of L2 metaphor processing.

Neurological activity in L2 metaphor comprehension

With advancements in science and technology, substantial psycholinguistics research has explored neural activities underlying L2 metaphor processing over the last decade. This section delves into electrophysiological evidence on cognitive load and hemispheric engagement in L2 learners during metaphor processing, using various advanced techniques. Methods such as eye-tracking, event-related potentials (ERPs), which measure brain activity with high temporal precision, and functional magnetic resonance imaging (fMRI), which tracks brain activity by measuring changes in blood flow, have been widely employed. In particular, ERPs help assess violations of semantic expectancies – the brain's prediction of upcoming words or meanings.

Different types of metaphors influence cognitive load in distinct ways. Conventional metaphors, being familiar and frequently used expressions, demand less cognitive effort, whereas novel metaphors, which are new or unfamiliar, require more cognitive resources due to their complex conceptual mappings (Abraham et al., 2021; Blasko & Connine, 1993). Scientific metaphors, often found in technical domains, necessitate both metaphorical understanding and specialized domain knowledge (Shen et al., 2022). Empirical studies provide insight into these cognitive demands. Studies on conventional metaphor comprehension (Li et al., 2019; Wang, 2018; Zhu et al., 2022) indicate that L2 metaphors elicit higher cognitive load and engage both hemispheres differently compared to L1 metaphors and literal sentences. Additionally, higher L2 proficiency leads to greater accuracy and cognitive resource usage. Research on novel and scientific metaphors has revealed even greater cognitive demands. Studies incorporating novel metaphors or scientific metaphors (Abraham et al., 2021; Shen et al., 2022)

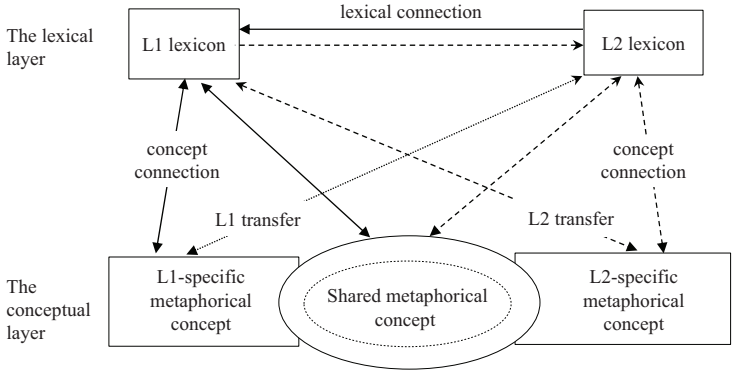

Figure 2 The developmental model of metaphorical-conceptual representation (Xu, 2014)

indicate that novel metaphors require higher cognitive effort and greater right-hemisphere engagement due to their unfamiliarity and complex conceptual mappings, while scientific metaphors exhibit high cognitive load due to their dual-contextual nature, necessitating the need for scientific inference and knowledge integration.

Though ERP studies provide valuable empirical evidence for bilingual mechanisms, they are limited by controlled experimental settings that may only partially capture natural language processing. A notable methodology limitation is the exclusive use of "X is Y" sentences to maintain consistency in sentence length and complexity, which restricts the generalizability of the results given the diversity of metaphorical structures. Additionally, electrophysiological studies have a limited role in depicting specific cognitive processes underlying the observed neural responses, failing to determine if the increased cognitive load for L2 metaphors is due to rejecting literal meanings or transferring explicit L2 knowledge. These ambiguities restrict the explanatory power to draw definitive conclusions about the mechanisms involved in L2 metaphor comprehension.

Discussion

Previous empirical investigations have revealed processing mechanisms and moderating factors that shape L2 metaphor comprehension across linguistic domains. However, controversies in existing mechanisms and methodological inadequacies require further attention to capture the multifaceted nature of linguistic and cognitive processes. This chapter critically reflects on the existing limitations and future implications from the perspectives of theoretical foundations, research focus, and methodology.

Regarding theoretical foundation, existing models for L2 metaphor comprehension have yet to establish a unified processing mechanism. Over the past three decades, academic debates have focused on two core approaches: rationale processing and contextual referencing. Rationale processing, a bottom-up approach, emphasizes the logical connection between the tenor and the vehicle of a metaphor, forming a pathway of "tenor - rationale - vehicle" (Wang et al., 2022). This approach primarily represents the fundamental perspective of mapping and matching mechanisms, where L1 or L2 concepts provide the rationale for linking the tenor and vehicle. Conversely, contextual referencing, a top-down approach, highlights the role of contextual information in inferring the vehicle of the metaphor. Kövecses (2015) notion of context-induced creativity further elaborates this perspective, arguing that metaphors arise dynamically from specific contextual pressures, such as cultural, social, and physical environments. Context allows L2 learners to interpret or create metaphors creatively, integrating semantic cues like literal meanings and contextual information. This aligns with the *Graded Salience Hypothesis* (Giora, 1997), which posits that salient word meanings are accessed first in the mental lexicon but are adjusted when mismatched with the surrounding context, as well as the *Semantic-context Effects* (Tulving & Gold, 1963), which highlight the role of context in word perception. The key difference between these approaches is that rationale processing focuses on the inherent structure of metaphors, while contextual referencing relies heavily on external cues from the surrounding environment to derive metaphorical meaning.

However, rather than adhering to one of the two pathways in models explaining L1 metaphor processing, a thorough review reveals that both rationale processing and contextual referencing are involved in L2 metaphor comprehension. For example, the *Analytical Model for Metaphor Comprehension* (Xu & Wang, 2014) demonstrated that L2 learners first engage in rational processing on literal translation before utilizing contextual referencing to reconcile the mismatch between literal and metaphorical meanings. Similarly, in Xu (2014) *Developmental Model of Metaphorical-conceptual Representation*, learners initially conduct rationale processing by relying on L1 conceptual transfer but increasingly integrate L2-specific metaphorical concepts as their proficiency improves, illustrating a gradual shift towards more contextually guided metaphor comprehension. These L2 models reflect how both pathways – initial rationale processing and later contextual referencing – interact, with L1 transfer serving as a starting point before contextual clues guide deeper metaphorical understanding. Future research should focus on identifying specific conditions under which these two pathways converge, and how their integration influences metaphor comprehension across varying proficiency levels and cultural contexts, thereby developing insight into a unified processing mechanism for L2 metaphor comprehension.

Furthermore, the limited scope and scale of existing studies often confine research to a single linguistic discipline, making reliance on current data inadequate for developing comprehensive processing models, thus leading to inconsistencies and disputes across different disciplines. For example, controversial

views have been presented on whether rejecting literal meaning is necessary for L2 metaphor comprehension, leaving it uncertain if L2 learners can directly access metaphorical meaning. Though conceptual knowledge of metaphors can facilitate rapid access to metaphorical meaning, existing evidence cannot deny the necessity of literal meaning activation and rejection. To resolve this controversy, future studies should consider cross-linguistic interdisciplinary research by integrating theoretical frameworks from neurolinguistics, cognitive and applied linguistics. Addressing the potential brevity of response times in electrophysiological measurements, and findings from concurrent and retrospective verbal reports and references from previous L2 processing models can provide triangulated evidence to resolve existing disputes on L2 metaphor processing mechanisms. This triangulation method, which incorporates references to existing models, quantitative data support, and qualitative data interpretation, can facilitate a thorough analysis and refinement of the processing patterns indicated by current research data.

Concerning the focus of research, much attention has been given to the strategy use and the association between learners' L2 proficiency levels and comprehension performance. Nevertheless, most studies rely on written reports, which emphasize cognitive resources but often overlook metacognitive strategies, posing a potential oversight. Subsequent research should address this limitation by incorporating both cognitive and metacognitive strategies to develop for a comprehensive model of L2 metaphor processing. Additionally, there have been controversial findings regarding the effect of L2 proficiency level on comprehension. Li et al. (2019) report a significant correlation between higher proficiency and better metaphor comprehension, while Yao (2019) suggests that this correlation is inconsistent across different proficiency levels. These discrepancies may arise from varying standards for grading levels and confounding variables such as learners' age of exposure to the L2 and length of exposure. Further investigation should examine the interplay between L2 proficiency levels and metaphor comprehension by employing longitudinal designs and controlling for confounding variables.

Regarding research methods, metaphorical tests are typically employed as stimuli in empirical studies, yet the selection of metaphorical expressions often lacks systematical screening criteria. Beyond basic categorization (i.e., conventional/novel, noun/verb), key factors moderating metaphor processing, such as transparency, decomposability, and familiarity, should be clarified to ensure test validity and reliability. Additionally, these tests often use electrophysiological or self-report methods. While electrophysiological research provides neurological evidence, it may not capture the complexities of real-world language use and the dynamic interplay of cognitive, contextual, and cultural factors in L2 metaphor processing. Self-report methods, which present questions as multiple-choice (Wu et al., 2021; Zibin, 2016) and open-ended responses (Xu, 2014), require participants to select answers or provide written/verbal reports. Despite their widespread use, multiple-choice formats can serve as cues for unfamiliar metaphors, and written reports may fail to capture learners' immediate, online processing. Think-aloud protocols offer in-depth data through real-time verbal reports, but are limited by time and resource demands, and the challenge of having participants verbalize in their L2. To address that, incorporating a mix of multiple-choice formats, open-ended responses, and think-aloud protocols can offer deeper insights into learners' online processing. Besides, using L1 in verbal reports can help them articulate their thoughts more effectively, improving the quality of qualitative data collected.

As for research subjects, previous studies primarily target EFL learners, with scarce attention given to L2 learners of other languages, resulting in a lack of comparative analysis of strategy and resource use across languages. English, as an alphabet script, allows L2 learners to prioritize phonetic decoding without requiring logographic recognition. In contrast, ideographic languages, such as Chinese, require learners to recognize logographic characters, which consist of both semantic and phonetic radicals. Some studies have shown that Chinese, as a hieroglyphic language, engages bilateral activation during semantic processing (Wang, 2018; Zhu et al., 2022). These differences suggest that L2 learners of ideographic languages exhibit unique patterns in metaphor processing. Significant emphasis should be directed towards learners with an alphabetic L1 and an ideographic L2, as their processing of ideographic characters can provide a holistic understanding of L2 metaphor comprehension.

In sum, the existing models have been effective in explaining some aspects of metaphor comprehension, but they do not fully address the cognitive complexities unique to L2 learners. Many of these models lack the integration of cross-linguistic data, which limits their applicability to global L2 contexts. Future research must incorporate interdisciplinary approaches and propose novel frameworks that take into account these limitations.

Conclusion

This review critically explored the processing mechanisms and moderating factors involved in L2 conceptual metaphor comprehension. While considerable progress has been made in understanding how L1 learners process metaphors, the complexities faced by L2 learners require more nuanced approaches. Many of the existing models, while insightful, fail to fully capture the cross-linguistic and cognitive challenges unique to L2 metaphor comprehension. This gap highlights the need for more comprehensive models that integrate insights from cognitive linguistics, neurolinguistics, and second language acquisition research.

Moreover, the review emphasized the importance of context and cultural knowledge in shaping how L2 learners interpret metaphors. The role of strategies like sentence context and lexical interpretation in resolving metaphorical meaning for L2 learners cannot be overstated. However, empirical evidence suggests that these strategies are often applied differently by L2 learners depending on their language proficiency and cultural familiarity. Future research should prioritize interdisciplinary and cross-linguistic studies to develop models that account for these complexities. Additionally, methodological improvements, such as integrating data triangulation and longitudinal studies, are essential to providing a more holistic understanding of L2 metaphor processing. By addressing these gaps, future studies can offer more effective pedagogical tools to support L2 learners in mastering metaphorical language. In sum, this review serves as a stepping stone for advancing research in L2 metaphor comprehension, offering practical directions for future studies that aim to capture the intricate interplay of cognitive, linguistic, and cultural factors in second language learning.

Conflict of Interest

The authors declare that there is no conflict of interest.

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The development of the Scat singing exercises in Jazz music

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Abstract

This creativity research is based on the qualitative method which aims to (1) study knowledge of scat singing and to create scat singing exercises in jazz music, and (2) evaluate student learning outcomes from the scat singing exercises. This study employed the research and development method. Research tools included structured interviews, index of item objective congruence (IOC), and achievement evaluation forms. Data providers were four jazz vocalists and jazz vocal instructors. The data collected were analyzed using the content analysis approach and presented in an essay format. The results revealed that steps for successfully practicing scat singing, consist of listening, syllable selection, song selection and rehearsal planning. The development of the scat singing exercises in jazz music found that the content of the exercises was divided into three difficulty levels: easy (1), medium (2), and difficult (3) and created in the form of video files, which were under the concept of jazz theory. The harmony included ii-V-I patterns, dominant seventh chords, and ascending and descending chromatic. The melody included non-harmonic tones (upper and lower neighboring tones), harmonic tones, tension notes, and enclosures. The rhythms included eighth notes, triplets, and quarter notes. There are twenty exercises and three levels of difficulty. The effective scat singing practice relies on having basic musical skills, especially those involving listening and imitating examples. The results of the scat singing evaluation from the target group of 20 participants, all first-year undergraduate students aged 18 or older majoring in jazz music, indicated a high level. The average score of knowledge and understanding was 4.19 with a standard deviation of 0.45 (M = 4.19, SD = 0.45). The average score of application was 4.30 with a standard deviation of 0.53 (M = 4.30, SD = 0.53).

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Introduction

Jazz music is a genre created by African Americans in the early 20th century, originating from blues and ragtime music. A key element of jazz performance is improvisation, which involves thinking and acting in the moment. Interesting improvisation depends on individual creativity and is not limited only to instruments but also to vocalists' improvisation.

Jazz vocalists mainly communicate with musicians and the audience. Their voice serves as an instrument known as scat singing. Vocal improvisation is more challenging than instrumental improvisation as it requires auditory skills, pitch accuracy, theoretical knowledge, imagination, emotion, and creativity (Weir, 2001, p. 23).

Today, jazz music is widespread in Thailand among both singers and listeners. Various activities such as jazz competitions, workshops, and concerts are held annually, attracting people's continuous interest and participation. However, only a few higher education institutions offer jazz courses, and it is found that there is a lack of resources for learning scat singing such as books, academic texts, and exercises. To spread the knowledge of scat singing broadly, exercises can be a tool to help beginners develop scat singing skills. This idea aligns with Seevarabuth's (2018, p. 91) view that skill exercises are an innovative teaching tool developed by instructors or trainers to help learners understand the lessons. Skill exercises allow learners to rehearse what they have learned and enhance their knowledge, understanding, proficiency, and thinking skill in students. Moreover, skill exercises are beneficial for both learners and those who are interested in the lessons.

Thus, to provide an opportunity for interested individuals to independently explore and develop scat singing skills and to address the teaching challenges of scat singing in Thailand as well as promoting and broadly expanding jazz singing curricula in Thailand, the researcher aimed to explore scat singing knowledge and create scat singing exercises in jazz music in the form of video files. The knowledge acquired from studying scat singing will provide an understanding of its principles in jazz music, and the techniques presented in the exercises can be applied to jazz music with similar characteristics.

Literature Review

From the study of literature related to creating scat singing exercises, the present study aims to explore the knowledge of scat singing and develop scat singing exercises, divided into 4 main topics as follows:

History of Jazz Music

Jazz music originated and evolved from the emotional and experiential expressions of African American slaves. The performance or singing of jazz initially lacked formal rules, notation, and standardized forms. Due to their socio-economic status and limited access to formal education, African Americans did not possess foundational skills in Western music theory. While engaged in labor, they frequently employed songs known as "Work Songs" to articulate their emotions. These work songs served as a critical foundation for the development of gospel music and blues, which subsequently led to the emergence of jazz (Laohverapanich, 2021, p. 33).

Scat Singing in Jazz Music

Jazz music is a genre that involves improvisation and collaboration among musicians. Improvisation presents a challenge that requires utilizing all musical skills at any given moment. The act of improvisation is a process where knowledge intersects with musical drama and natural expression (Jackson, 2002, p.45).

Scat refers to improvisation using vocalizations with nonsensical syllables or sounds that do not form actual words (Davis, 2012, p.231).

The historical development of the origins of scat singing reveals that to perform jazz singing, one must first learn to sing the blues. The origins of blues music can be traced back to the 17th century, a period when the United States had a large population of enslaved individuals (Shapiro, 2015, p.2).

The evolution of scat singing began with melodic variations and later developed into more complex and exciting melodies. This progression presents greater challenges for the vocalist. Music theory becomes essential, with chords, scales significant roles. As Weir (2015, p. 36) states, "Everything starts with chords and chord progressions. Beginning with root notes, the singer transitions to notes within the chord, employs chromatic movement, and then adjusts according to the chords."

Exercises

Exercises or skill practice materials refer to tools, innovations, or instructional media designed for students to practice skills in a particular subject. They include various interesting activities aimed at helping students review content, understand what they have learned, and consequently improve their learning behavior with increased proficiency and accuracy.

Additionally, they serve as tools to assess knowledge development and the ability to apply that knowledge effectively.

Good practice materials should have clear objectives and align with the intended goals. The language used and images should be appropriate for the age and background of the learners and should cater to individual differences. The materials should allow learners to practice independently and should include exercises at various levels of difficulty—easy, medium, and hard—so that learners can choose according to their abilities.

The Evaluation

Evaluation is the judgment concerning the quality or value of objects, projects studying the work behavior of workers, or the knowledge and abilities of students. Thus, evaluation is a process of assessing value (Ebel & Frisbie, 1986, p. 13).

The evaluation process consists of planning, implementation, reporting and dissemination of evaluation information. The main goal of evaluation is to produce evaluation results that can be used to develop the value of what is being evaluated. Therefore, evaluation results are an important factor that influences the use of evaluation results and causes subsequent impacts.

The dissemination of evaluation information is a process related to communication. Therefore, evaluators must have good communication skills and be able to develop creative strategies to find channels to disseminate information to those involved in the evaluation by selecting the type, format and presentation of evaluation reports that are appropriate for the target group. There are many ways to use evaluation results, including: Conceptual use: evaluation results may help spark ideas among those involved, resulting in greater understanding of what is being evaluated; Legitimate use: evaluation results may be used as reasons to support or confirm pre-determined decisions; Symbolic use: evaluation results may be used as a tool to monitor, direct or control the evaluation to see if it has been done according to the specified guidelines; and Instrumental use: evaluation results may be used as a tool for improvement, correction and impact on subsequent changes. The use of evaluation results can affect operations at both the individual and organizational levels, potentially causing changes in the behavior of members of the organization, work methods and regulations of the organization. Organizational structure and organizational culture (Kanjanawasee, 2011, p. 151).

Methodology

This research utilized the Research and Development (R&D) framework, which consisted of four stages:

Stage 1 (Research: R1): First, literature review on jazz music theories and scat singing was done. The target group and informants were selected by the researcher. The target group were selected based on criteria established. The criteria for the target group included individuals with a background in vocal performance who were currently studying in their first year of an undergraduate program, aged 18 or older and majoring in jazz music. The target was not gender-specific and consisted of 20 participants.

The researcher selected the sample song using a purposive sampling, by selecting “All of me” from the album *Swingin’ Easy* by Sarah Vaughan, recorded in 1957. The song was composed in 1931 by Seymour Simons and Gerald Marks. It was first introduced by Belle Baker, a Vaudeville star, who introduced the song to the public via radio in 1931 and performed it on stage at the famous Fisher Theatre in Motor City. Soon after, song became popular. “All of Me” serves as a tool for developing scat singing exercises in jazz music. This song is categorized as a jazz standard and is widely popular for both vocal performance and instrumental arrangements. Its slow harmonic progression makes it suitable for beginners in scat singing. The exercises are developed from Sarah Vaughan's scat in “All of Me,” as her scat style features clear lyrics, a wide vocal range, and a variety of syllables. Each exercise has a fixed tempo of quarter notes equal to 120 bpm in a swing rhythm.

There are 20 exercises in total. The content of the exercises was divided into three difficulty levels: easy (1), The melody uses harmonic tones, the harmony employs ii-V-I patterns, and the rhythm consist of triplets and quarter notes; medium (2), The melody included harmonic tones and tension notes, the harmony employs ii-V-I progression, The rhythms included eighth notes, triplets, and quarter notes, the harmony followed an ii-V-I progression; and difficult (3), it is an application that takes exercises 1 and 2 and develops them into 3. This difficult exercise (3) consists of a melody that includes harmonic tones and tension notes, harmony that employs an ii-V-I progression, and rhythms that include eighth notes, triplets, and quarter notes.

In the selection of key informants, the researcher specifically chose four individuals who were jazz vocalists and jazz vocal instructors. Additionally, for the evaluation of instrument quality, the researcher selected

three experts with specialized knowledge in jazz music, jazz vocal instruction, and western vocal instruction. Next, interview forms and tools were validated by three qualified individuals. Then, informal interviews regarding scat singing were conducted.

Stage 2 (Development: D1): Scat singing exercises in jazz music were validated by advisors and three experts. The researchers selected these experts based on their expertise in jazz music, teaching jazz performance, and teaching western vocal music. Instructional videos and the evaluation form were developed and assessed by three experts. Later, the exercises were revised and adjusted into the complete versions.

Stage 3 (Research: R2): After creating the exercises, the researcher developed them into online media and applied them to a target group of 20 participants. by organizing a 3-day workshop on scat singing, with eight hours each day. Evaluation of scat singing proficiency using the exercises in jazz music and non-participant observation were performed. The scat singing exercises were analyzed using descriptive statistics. Evaluation of scat singing proficiency using the exercises in jazz music and non-participant observation were performed. The scat singing exercises were analyzed using descriptive statistics. The data analyzing was in two aspects: 1) knowledge and understanding consisting of 5 aspects: understanding the concept of scat singing, choosing syllables, the scat singing exercises are beneficial and can help develop skills., explaining scat singing according to its principles, and understanding swing rhythms, and 2) application consisting of three aspects: applying the concepts and knowledge you have gained, selecting lyrics and creating your own scat style, and conveying knowledge to others effectively, by calculating the mean (M) and standard deviation (S.D.) and scoring each item.

The scoring criteria were set using a 5-level (Likert Scale) as follows:

Score Level	Consideration:
5 points	Most
4 points	Much
3 points	Moderate
2 points	Little
1 point	Least

The evaluation criteria will consider the average score as follows:

Average Score Level	Consideration:
Average between 4.51 – 5.00	Most
Average between 3.51 – 4.50	Much
Average between 2.51 – 3.50	Moderate
Average between 1.51 – 2.50	Little
Average between 1.00 – 1.50	Least

Then, the average scores for each item are summed and divided by the number of items to obtain the overall average score for that aspect. The resulting score is then interpreted and summarized.

Stage 4 (Development: D2): Scat singing achievement was analyzed through the non-participant observation in order to improve the activities to be suitable, and the results were concluded, discussed, and disseminated to the general public.

Research Tools

The researcher developed research tools from data collection from documents, textbooks, academic papers, and interviews. The tools included structured interviews, Index of Item Objective Congruence (IOC), Scat singing exercises and Achievement evaluation forms.

Results

In this study, the researcher presented the data analysis by dividing the information into two objectives as follows:

The First Objective of the Research; the Result is Divided into Two Parts as Follow:

Part 1: Knowledge of scat singing

The researcher studied the knowledge of scat singing by interviewing four individuals who were jazz vocalists and jazz vocal instructors. The researcher identified issues related to scat singing, including practicing scat singing, choosing syllables, vocal techniques, model songs, and effective scat singing. The study of scat singing knowledge from key informants outlined the following guidelines for practicing scat singing. The results of the study found the steps for successfully practicing scat singing as follows:

In practicing scat singing, the first step should be listening to and practicing the main melody by choosing songs with a simple main melody and study examples of transcribed scat songs at an easy level sung by vocalists or played with instruments such as the saxophone, trumpet, trombone, etc. A detailed analysis of how the main melody works with the harmony should also be performed to understand the principles. Practitioners should have basic jazz music theory knowledge including scales, modes, and various types of dominant seventh chords and should practice major scales, minor scales (melodic minor, harmonic minor, natural minor), blues scales, and pentatonic scales. Then, select favorite phrases from transcribed songs to use in creating one's own scat and apply this to other songs.

Choosing syllables for scat singing can be done freely. The best syllables depend on the rhythm and articulation of the notes, for example, by singing "Do Bah Bah Do Dat / Do Bah Do Bah Do Da" to match the rhythm of the notes. Singing short, sharp notes, a singer might use syllables starting with similar vowels like "ta" or "pa." For very short notes, use "Doo Dun Dil," etc. The simplest method is to practice by imitating the syllables from the transcribed songs as accurately as possible or mimicking the sounds of the instruments heard.

Vocal techniques affecting scat singing are that vocalists must use their vocal range correctly, control volume, create rhythms, and manage breath to produce accurate melody pitches. Scat singing focuses less on beauty and more on tone and timbre changes as it has no difference from normal use of voice.

Model songs for practicing scat singing include blues songs such as "Straight No Chaser" composed by Thelonious Monk, Jazz standard songs including "Route 66" by Bobby Troup, "Take the A Train" composed by Billy Strayhorn, "Satin Doll" composed by Duke Ellington and Billy Strayhorn, with lyrics by Johnny Mercer "Billie's Bounce" composed by Charlie Parker "Equinox" composed by John Coltrane and "All of Me" composed by Gerald Marks and Seymour Simons. Transcriptions from trombone solos by Curtis Fuller in "Blue Train" from John Coltrane's album "Blue Train" are also useful. The style and accent of the songs influence scat singing, and the choice of songs depends on personal preference. Model artists include Bobby McFerrin, Louis Armstrong, Ella Fitzgerald, and Sarah Vaughan.

Effective scat singing practice involves planning, practicing with instruments like the piano, listening to a lot of music, performing publicly, joining music events, and recording oneself singing to analyze personal performance and practice swing rhythm patterns using quarter notes, triplet notes, and quarter notes.

Part 2: Creating scat singing exercises in jazz music

Creating scat singing exercises in jazz music involved using scat singing knowledge and Sarah Vaughan's scat singing in "All of Me" from the album "Swingin' Easy," recorded in 1957. The song was composed in 1931 by Seymour Simons and Gerald Marks. It was first introduced by Belle Baker, a Vaudeville star, who introduced the song to the public via radio in 1931 and performed it on stage at the famous Fisher Theatre in Motor City. Soon after, the song became popular. A total of 20 exercises were developed by choosing various motifs and using sequence techniques with transpositions to cover all scales. The exercises ranged in pitch from F3 to G5 and the lyrics were revised into a suitable format. The exercises were divided into three difficulty levels: easy (1), medium (2), and difficult (3), summarized as follows:

Example 1 The development of the scat singing exercise in Level 1 shown in 2 figures (Figure 1 and 2).

From example 1, the original notes in bar 22 of the song developed to the scat singing exercise no. 3 in Level 1 as shown in Figure 1 and 2. All pitch levels were derived from the original notes, with the melody and harmony transposed down by a half step. The melody consisted of chord notes and lower neighboring tones (LN).
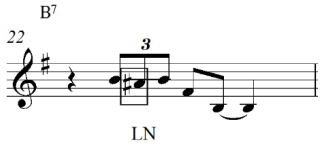
Figure 1 The original notes in bar 22 of the song

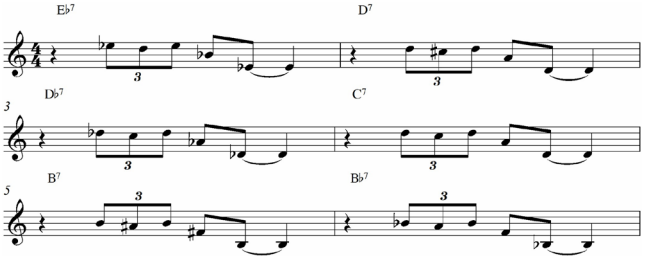

Figure 2 Exercise no. 3

Example 2 The development of the scat singing exercise in Level 2 shown in 2 figures (Figure 3 and 4).
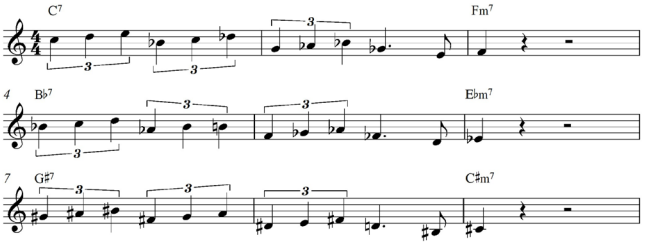
Figure 3 The original notes in bar 23–25 of the song
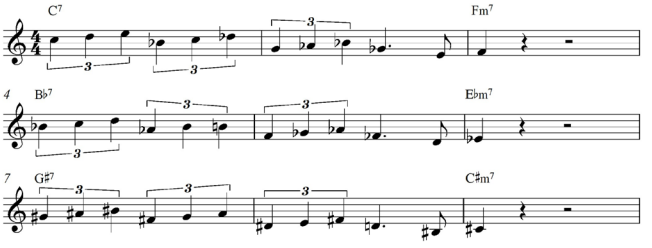
Figure 4 Exercise no. 15

From example 2, the original notes in bar 23–25 of the song developed to the scat singing exercise no. 15 in Level 2 as shown in figure 3 and 4. All pitch levels were derived from the original notes, with the melody transposed down by a half step. The melody included chord notes and tension notes (♭9 in bar 23 at F, ♭13 in bar 24 at C, and enclosures (EC) in bar 24–25 at B♭ and G# to A in bar 25). The harmony followed an ii-V-I progression.

Example 3 The development of the scat singing exercise in Level 3 shown in 3 figures (Figure 5, 6 and 7).

From example 3, the original notes in bar 23–25 of the song from exercises 15 in Level 2 and 13 in Level 1 were combined to develop the scat singing exercise no. 20 in Level #3 as shown in figure 5, 6 and 7. All pitch levels were derived from the original notes, with the melody transposed down by a whole step. The chord followed an ii-V-I progression. The melody included chord notes and tension notes (♭9 in bar 23 at F, ♭13 in bar 24 at C, and enclosures (EC) in bar 24–25 at B♭ and G# to A in bar 25). The melody of exercise 13 was in Am (Maj7) chord, which can also be used with Am7.

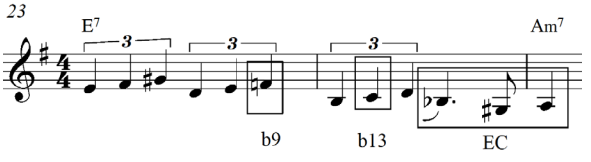

Figure 5 The original notes in bar 23–25 of the song
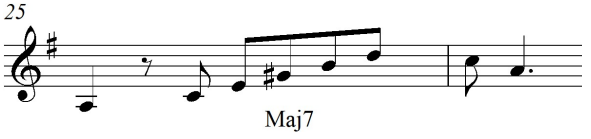
Figure 6 The original notes in bar 25 of the song
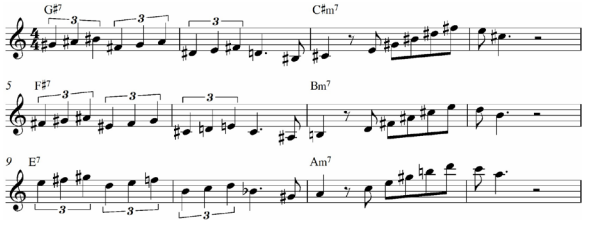
Figure 7 Exercise no. 20

The Second Objective of the Research; The Results are as Follows:

Evaluate student learning outcomes from the scat singing exercises.

The researchers studied knowledge of scat singing and created scat singing exercises in jazz music in accordance with the first objective. After creating the exercises, scat singing exercises in jazz music were validated by advisors and three experts. The researcher developed them into online media and applied them to a target group of 20 participants, who were first-year undergraduate students majoring in jazz at Conservatory of Music, Rangsit University, by organizing a 3-day workshop on scat singing, with eight hours each day. A scat singing workshop for jazz was organized, featuring scat singing experts as speakers. The training content was divided into topics including the history of jazz, jazz artists and songs, jazz improvisation, and scat singing group activities. Data were collected from behavior observation and scat singing achievement scores were analyzed in order to use the exercises in two aspects:

1. Knowledge and Understanding

The average score was 4.19 with a standard deviation of 0.45 (M = 4.19, SD = 0.45). It was found that the target group demonstrated a good understanding of scat singing, creativity in motif creation, and appropriate syllable selection at a high level.

2. Application

The average score was 4.30 with a standard deviation of 0.53 (M = 4.30, SD = 0.53). It was found that the target group applied the knowledge gained from the trainings and were able to select appropriate syllables and effectively conveyed the concepts to others at the high level. Figure 8 show that participation in the target group's scat singing training.

Figure 8 Participation in the target group's scat singing training

Discussion

The study of scat singing knowledge led to the discovery of the following steps for successfully practicing scat singing:

Listening

The first step in starting to practice scat singing is listening. This includes listening to the main melody of songs, listening to original transcriptions from vocalists or instruments at an easy level that features a slow harmonic progression, making it suitable for beginners in jazz singing and listening to various scales from basic to advanced. Listening helps in recognizing notes and harmonies, aiding the understanding of how the main melody works with harmonies. After this, a practitioner chooses favorite phrases and creates his or her own scat, emphasizing repetitive practice with subsequent songs.

Syllable Selection

When choosing syllables for scat singing, there are no set lyrics; one can freely vocalize as appropriate to the rhythm of the notes. Common English consonants used include D and B, combined with vowels. The simplest method is imitating syllables from vocalists or instruments heard. The focus is not on the beauty of the sound but on tone changes and timbre. Despite the similarities to regular vocal sounds, basic singing techniques affecting pronunciation and breath control are necessary. This aligns with Euprasert (2017, p.98), who stated that in selecting scat lyrics, studying the originals (such as saxophone or trumpet sounds) is recommended, as the specified lyrics can be adjusted for suitability. Each person's different singing techniques can highlight different vowels clearly, which can be adapted to individual preferences. When choosing syllables, one should consider the appropriateness for controlling the character of each note as there are a lot of stressed words used in scat singing. Commonly used vowels for emphasis are ‘ee’ (or ‘ay’) for high notes and ‘ah’ and ‘oo’ (or ‘ay’) for low notes.

Song Selection

Model songs for practicing scat singing include blues songs and jazz standard songs. However, the selection of songs depends on the preferences of each person. Model artists include Bobby McFerrin, who employs high-pitched vocal techniques and develops motifs to create diversity in pitch range, rhythm, and harmony. Louis Armstrong, who can effectively convey the swing rhythm, which is the heart of jazz music. Ella Fitzgerald, who utilizes motifs and melodic sequences with major and minor scales, pentatonic scales, and arpeggios, as well as connecting melodic lines with chromatic notes, a unique style of improvisation similar to a question-and-answer style, and Sarah Vaughan, who uses both low and high notes.

Rehearsal Planning

Effective scat singing requires planning each practice session to achieve efficiency and gain new perspectives from other vocalists or musicians, as well as to inspire continued practice. Finding performance opportunities, attending live performances, and recording oneself during practice are beneficial. This idea aligns with Baker (2010, p.23), who mentions the important skills for scat singing, and introducing to singers and jazz musicians that scat singing involves the use of nonsensical or improvised syllables during vocal improvisation. Scat solos are often found to mimic a variety of instrumental techniques and styles. There is not a fixed or only single method for teaching scat singing; the improvisational nature of the technique encourages experimenting with different styles and approaches. However, developing aural skills, understanding theoretical concepts, and refining vocal techniques are essential components of learning scat singing. Listening to exemplary scat singers such as Ella Fitzgerald, Cab Calloway, Carmen McRae, Sarah Vaughan, Al Jarreau, Karrin Allyson, Dave Matthews, Bobby McFerrin, and Jon Hendricks is highly beneficial. These artists offer a broad range of styles and interpretations, making them ideal models for those learning scat singing.

The creating of scat singing exercises in jazz music was based on the scat in Sarah Vaughan’s version of “All of Me,” a notable jazz artist. These exercises help improve scat singing and are particularly beneficial for undergraduate vocal students in Thailand, as well as those interested in scat singing. From the analysis of the research results, it was found that in the exercises developed using jazz music theory, the content consisted of three main components: harmony, melody, and rhythm.

The harmony follows the original motif's chord progression, including ii-V-I patterns, dominant seventh chords, and ascending and descending chromatic lines.

The ii-V-I progression is used most frequently to develop the ability to recognize harmonies. It is a common basis for improvisation. This idea aligns with Baker (2010, p.24) that prerequisite skills to scat singing are foundational understanding of music theory and the ability to identify changing harmonic progressions by ear. Practicing exercises based on the ii, V, I chord progression within the circle of fifths can help students recognize chord symbols and internalize harmonic changes. As students become more comfortable with chord structures and spellings, this exercise can be extended to include more complex progressions.

The melody follows the original notes, using various notes to reflect jazz accents, including non-harmonic tones (upper and lower neighboring tones), harmonic tones, non-chord tones (♭9, ♭13, and #11), and enclosures. This use of notes aligns with Lopez-Brandt (2023, pp.62–63), who analyzed the improvisation of three musicians in Miles Davis's "So What" and found that the musicians used individual musical elements and performance accents to create interesting improvisations, changed melodies for variation, and used tension notes to add a jazz flavor.

Rhythms in the exercises incorporated swing rhythms. To understand the swing rhythms and be able to apply them into practice, certain rhythms were selected for practice. The rhythms included eighth notes (quaver), triplets, and quarter notes. This corresponds with Fin (2000, p.16), who noted that swing rhythm practice, fundamental for drummers, often uses triplet-based rudiments, which requires practice to grasp the swing feel.

Evaluation of the use of these scat singing exercises in jazz revealed that effective scat singing practice relies on having basic musical skills. Individuals with foundational singing skills can quickly follow the exercises, especially those involving listening and imitating examples. Using the exercises provides a framework for developing new creative ideas independently. Continuous, planned practice leads to proficiency together with repeated exercises helping to master the skills. This approach aligns with Charoensook (1999, pp.13–17), who described a systematic teaching approach with four steps: (1) listening (listening to songs, an instructor's demonstration as part of the exercises, or other kinds of learning materials); (2) imitation (imitating the instructor's skills or his/her teaching materials); (3) repetition (learners repeatedly doing the practical exercises); and (4) internalization (after undergoing Step 3 until the learner becomes proficient), he/she will internalize the skills learned and practiced and be able to perform naturally.

Scat singing typically involves spontaneous, unprepared performance. Using set exercises for preparation is a form of practice that may seem less natural. However, this method ensures consistent practice, which is crucial for learning and allows singers to eventually "think outside the box" and enjoy the creative process of scat singing. This concept is supported by Baker (2010, p. 28), who describes students' scat singing performances, noting that the final one is typically a standard scat solo with specified chord progressions. While this method might appear "rehearsed" and lack the element of spontaneity, it ensures that each singer follows a consistent, dependable, and secure approach. Figure 9 show that exercise 1–20.

Figure 9 QR CODE: Exercise 1–20

Conclusion and Recommendation

The evaluation results from using scat singing exercises demonstrated the success of the target group in creating melodies and lyrics. To utilize exercise materials, the scat singing practice process should be further studied to provide guidance for successful rehearsals. Starting with exercises 1, 2, and 3 in sequence is recommended. Trainees can apply the motifs of each scat singing exercise to other songs with swing rhythms and can also create scat lyrics beyond the provided examples.

For future studies, it is advisable to develop scat singing exercises for practicing various rhythmic patterns. This will serve as a guide for further knowledge development in scat singing for students, singers, and interested individuals. Creating online resources with English subtitles for music education would help disseminate musical knowledge globally. Additionally, it is suggested to develop scat singing exercises covering all vocal ranges—bass, tenor, soprano, and alto.

Conflict of Interest

The author declares that there is no conflict of interest.

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Guidelines for the conservation and inheritance of the lotus culture: A case study of Pathum Thani Province, Thailand

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Abstract

Lotus has been a symbol of religious significance in Thai society and culture since ancient times. The inheritance of values and beliefs regarding the lotus reflects its enduring societal importance in Thailand, particularly in areas with local historical ties to lotus cultivation. This study aims to identify the conditions that influence the conservation and inheritance of lotus culture, employing qualitative research methods such as document analysis, in-depth interviews, focus group discussions, and participatory observation. The study area is Pathum Thani Province, Thailand. Findings reveal that internal conditions influencing lotus culture conservation and inheritance include: (1) local historical background of Pathum Thani Province; (2) awareness of Pathum Thani's identity and (3) cultural reproduction, and perceptions of the lotus. External conditions include: (1) adaptation necessity; (2) economic conditions, and (3) political conditions. Strategies for lotus culture conservation and inheritance include: (1) promotion and support across the lotus lifecycle; (2) application of technology in conservation efforts; (3) continuous and equitable collaboration among government, private sector, and communities, and (4) establishment of cultural networks both within and beyond community boundaries. The guidelines for the conservation and inheritance of the lotus culture emphasize fostering a collective sense of cultural ownership through the participation of all stakeholders, such as families, educational institutions, and various sectors. Modern technology, including digital platforms, is utilized to promote cultural dissemination. Additionally, collaborative efforts between the community, government, and private sectors are essential to ensure cultural sustainability. Building networks is also crucial to strengthen and drive cultural conservation efforts further.

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Introduction

Lotus is a flower that plays a significant role in life and is revered as a sacred flower. It is believed to be one of the first plants to emerge on Earth. Lotus symbolizes the creation of various deities, whether in Buddhism or Hinduism, often intertwining with legends. In general perception, the lotus represents the valued and popular aspects of religion. It is included as an auspicious flower in various ceremonies (Prawong, 2021). Furthermore, the lotus is utilized in various ways, such as in culinary dishes, medicinal purposes, decorative uses, and ceremonial flower arrangements. Recognizing the benefits of lotus for health and its cultural significance globally has consistently contributed to its enduring popularity and beliefs within societies. Pathum Thani Province, located in central Thailand and adjacent to Bangkok, is characterized by its flat, riverside landscape traversed by the Chao Phraya River. The province is renowned for its abundance of lotuses and has been named Pathum Thani district since the reign of King Rama II. Historical accounts of Pathum Thani illustrate its fertility in water resources, rice, and lotuses since ancient times (Pathum Thani Province, 2024). This reflects Pathum Thani's identity as a city of lotuses, evident in its provincial emblem and motto where the lotus serves as a defining component of its urban identity.

Numerous studies show that the social environment, audience preferences, communication style, and form of heredity are all important aspects of cultural conservation and inheritance (Zhang et al., 2021). In order to ensure ongoing cultural inheritance, social institutions play a crucial role in the reproduction of cultural ideas and values. According to Ganjoo and Verma (2021), the family institution is the first social institution that teaches new members values, ideas, and ways of thinking so they can become familiar with the culture of the community. Another important social institution is education, which is essential for fostering national identity and society ideas in the next generation of citizens (Kavousy & Tohidy, 2010). Research by Kang (2022) demonstrates that, of all the main techniques for promoting and inheriting culture, education is the most successful. Furthermore, the continuous conservation and transmission of culture will be ensured by having cultural networks prepared to receive funding and support from the public and private sectors, as well as from the family, community, district, and province (Atawongsa, 2017; Nanthasri, 2021; Sapathong et al., 2016). Waylen et al.'s (2010) work focuses on the role of local cultural and institutional contexts in conservation efforts. The study investigates whether interventions that aim to engage with local culture influence conservation outcomes. It finds that the local institutional context significantly affects the success of these interventions. In other words, conservation efforts that align with and involve local institutions tend to have higher chances of success. However, the study notes limited support for certain factors, such as community participation, conservation education, benefit-sharing, and market integration, in predicting the success of these interventions. It suggests that while these elements are important, they do not consistently determine the outcomes. Furthermore, successful conservation interventions often adapt their activities to fit the social contexts in which they operate, demonstrating an understanding of the local community. The research highlights the value of systematic reviews in evaluating conservation evidence, although it acknowledges the challenge posed by the frequent lack of high-quality reporting on conservation efforts.

Based on the points mentioned above, it can be seen that the general perception of Pathum Thani Province is shaped by its local culture, which reflects the area's wisdom. This includes being known as the 'City of Lotuses,' the 'City of Rice,' its Mon culture, and its industrial status, all of which represent a spatial relationship between the land and its people. Particularly when referring to the 'City of Lotuses,' a symbol of Pathum Thani, the repeated use of the lotus symbol continues to be preserved in the local culture, maintaining the province's image through this symbol. This led to the present study, which seeks to identify the conditions that influence the conservation and cultural inheritance of the lotus culture, ensuring its continuity in order to design guidelines for the conservation and inheritance of the lotus culture in Pathum Thani Province. The conservation and inheritance of culture affect the community's progress and well-being while preserving its identity. Additionally, the conservation and inheritance of culture play a significant role in fostering connections within the community and promoting understanding between people from different cultural backgrounds, serving as a guide to preserve and pass on the area's cultural heritage for future generations.

Literature Review

The Concept of Cultural Conservation

Cultural conservation focuses on preserving both tangible (e.g., artifacts, sites) and intangible (e.g., traditions, languages) heritage to maintain their historical, aesthetic, and social significance for future generations.

Key aspects of cultural conservation include (International Centre for the Study of the Preservation and Restoration of Cultural Property [ICCROM], 2015; United Nations Educational, Scientific and Cultural Organization [UNESCO], 2015):

1. Balancing Preservation and Utilization: Finding a balance between keeping heritage in its original state and adapting it for contemporary uses, such as tourism, without compromising its integrity.

2. Social, Economic, and Ecological Significance: Cultural heritage fosters social cohesion by promoting shared identities and histories, while also stimulating economic growth through tourism and creative industries. Additionally, traditional practices often hold ecological knowledge that supports sustainable living.

3. Community Involvement: Effective conservation requires active community participation to align conservation efforts with local cultural values and needs. Research, such as by Abdul Aziz et al. (2023), shows that community engagement in managing cultural heritage enhances sustainability by fostering local ownership.

4. Integration with Sustainable Development Goals: Connecting cultural preservation with broader sustainability programs fosters social justice, environmental conservation, and the safeguarding of cultural heritage. Studies such as Mansoury (2024) and Ariza-Colpas et al. (2024) highlight the importance of applying eco-friendly practices and digital technologies, including augmented reality (AR), to enhance sustainable cultural preservation and promote greater public participation in heritage conservation efforts.

However, cultural conservation faces significant challenges, including limited resources, competing development priorities, and the risk of turning heritage into a commodity. Overcoming these obstacles demands innovative strategies and global collaboration to ensure the preservation of cultural authenticity while keeping it relevant for future generations.

The Concept of Cultural Inheritance

Cultural inheritance involves passing down traditions across generations through development, adaptation, reinterpretation, and recreation based on original cultural foundations, ensuring continuity and uniqueness. Identity plays a crucial role in understanding the self of individuals, communities, or organizations by highlighting the key characteristics that differentiate and define them. Social identity refers to an individual's sense of belonging to a group, formed through the categorization of people, the prominence and status of the group, the distinctiveness of out-groups, and the factors related to the group's traditional foundations. Social identity leads to actions that align with the identity, including stereotypical perceptions of oneself and others (Ashforth & Mael, 1989; Hogg et al., 1995). Thus, the emergence of this 'meaning' allows people to become aware of who they are and which society they belong to, ultimately shaping the 'identity' of individuals within that social group. It is evident that culture defines the differences between social groups and maintains 'identity' amidst the diversity of social groups (Woodward, 2018). Identity is a crucial condition in the inheritance of a group's culture.

As society evolves, cultural adaptation is crucial for inheritance, while cultural reproduction, as Bourdieu explains, helps sustain cultural norms, values, and social structures through social capital like language and education (Bourdieu, 1984; Dolrung et al., 2017). This process is vital for cultural sustainability, as a culture must be perpetuated to endure, with production, distribution, consumption, and reproduction forming the reproduced culture. A culture that gains acceptance is referred to as the "Culture of the Period" (Kongpikoon, 2012).

Research by Yan and Li (2023) highlights the role of educational institutions, particularly universities, in cultural inheritance. Their findings show that protecting intangible cultural heritage (ICH) through university education, integrated with heritage and cultural tourism studies, enhances cultural awareness and social participation. Additionally, the use of modern technology and digital platforms broadens and sustains cultural practices, emphasizing the need for policies to support digital preservation (Zhou et al., 2021).

Conceptual Framework

The research framework divides conditions influencing the conservation and inheritance of lotus culture into two main categories: internal and external conditions. Internal factors include the local history of Pathum Thani, where lotus cultivation is deeply tied to the region's cultural identity. Another key internal condition is cultural reproduction, the ongoing process by which the community preserves its beliefs and practices related to the lotus. External conditions involve the need for adaptation to changing social and environmental contexts, especially regarding economic conditions such as capitalism. Additionally, policy conditions play a role, with government policies supporting long-term cultural conservation efforts. These factors collectively form the guidelines for the conservation and inheritance of lotus culture in Pathum Thani, which could also be applied to other regions for cultural preservation.

Methodology

This research employed a qualitative research methodology as follows:

Key Informants

The key informants in this research consist of two main groups, with the qualifications of each group defined as follows:

1. The key informants for the in-depth interviews comprise a total of 18 individuals involved in the conservation and inheritance of lotus culture. These include 3 lotus farmers, 2 owners of lotus-related tourist sites, the director of the lotus museum, 7 representatives from community enterprise groups or OTOP product manufacturers that produce items made from lotus or feature the lotus as a symbol, and 5 representatives from government and private organizations involved in policies related to the promotion and preservation of lotus-based culture. These individuals contribute extensive experience in lotus cultivation, tourism, and product development, playing vital roles in maintaining and promoting the lotus culture in Pathum Thani Province.

2. The key informants for the focus group discussions, aimed at conducting a SWOT analysis to identify strategies for the conservation and inheritance of lotus culture, consist of two target groups. The first group comprises 12 entrepreneurs involved in lotus-related businesses, such as lotus farmers, operators of lotus tourism destinations, and community enterprises producing lotus products. The second group includes 24 community members who serve as cultural inheritors of the lotus heritage, half of whom are native to Pathum Thani and have lived there for over 10 years, while the other half moved to the area and have resided there for a decade or more.

Data Collection

Three main sources were used to collect the data: field sources, individual sources, and documentary sources.

1. Documentary Sources: these included books, research papers that were relevant to the topic, articles, and textbooks. These records offered historical background and a theoretical framework for comprehending the lotus's cultural significance.

2. Individual Sources: Focus groups and in-depth interviews were conducted to gather information from individual sources. As previously mentioned, 18 key informants participated in the in-depth interviews, and 36 key informants took part in the focus group discussions to analyze the SWOT and develop strategies for the conservation and inheritance of lotus culture.

3. Field Sources: participant observation during lotus-related community events, such as the production of lotus products and the observation of tourists touring the lotus fields, was used to collect field data. A greater comprehension of the useful components of lotus culture and its dissemination was made possible by this method.

Data accuracy was verified through methodological triangulation, cross-checking different collection methods, and data triangulation by comparing content from at least three key informant sources.

The research tools consisted of semi-structured interviews for in-depth interviews and question guidelines for focus group discussions. The data collection period was from July to December 2022.

Data Analysis

A thorough synthesis of the data from all four data collection methods was required for data analysis. First, the data were categorized based on the goals of the research. The interpretation of field phenomena and the careful examination of data from distinct sources were done. After that, the data were combined and given in a descriptive manner in line with the predetermined goals of the study.

Results

Conditions Influencing the Conservation and Inheritance of the 'Lotus' Culture

The conditions influencing the conservation and inheritance of the lotus culture in Pathum Thani Province can be divided into two conditions: internal and external conditions, as summarized in Table 1

Table 1 Comparison of internal and external conditions influencing lotus culture conservation

Condition	Internal conditions	External conditions
Historical context	Local history of Pathum Thani as "City of Lotus"	Economic conditions such as capitalism and market demand
Cultural reproduction	Continuous reproduction of lotus symbolism	Government and policy support for cultural conservation
Awareness of identity	Strong identification with lotus as a cultural symbol	Need for adaptation in food, crafts, and tourism activities

The explanation of Table 1 is as follows:

1. Internal Conditions include:

1.1 Local History of Pathum Thani Province

Since ancient times, Pathum Thani Province has been known as the 'City of Lotus.' As a result, the lotus has come to represent Pathum Thani to the outside world. The preservation of Pathum Thani's reputation has been bolstered by the passing down and instillation of local history from generation to generation. Pathum Thani is mentioned in Sunthorn Phu's work 'Nirat Phu Khao Thong,' which likewise reflects this. As a result, in modern art projects, the lotus is frequently integrated into new works. The lotus is widely employed in Thai culture for a variety of purposes because of its good symbolic meanings, beauty, and auspiciousness in addition to symbolizing the identity of its founders through local history.

1.2 Cultural Reproduction

The conservation and inheritance of the lotus culture in Pathum Thani Province stem from the continuous transmission of values and symbolic beliefs tied to the lotus. Passed down through generations, the lotus has become central to cultural reproduction, reinforcing the identity of Pathum Thani's people, who collectively embrace it as a symbol of their city. Institutions like families, schools, media, and religious organizations play key roles in this process. Awareness of the lotus emblem is essential to preserving the culture, as it helps maintain the community's unique identity. As a result, the lotus is widely present in the province's activities, products, and crafts, such as lotus handicrafts and Mon shawls. Interviews reveal that a strong sense of identity inspires both traditional and modern reproductions of the lotus, which have been reinforced by social institutions over time, shaping the identity of Pathum Thani's citizens.

2. External Conditions include:

2.1 The Necessity of Adaptation (Adaptation for Inheritance)

The adaptation of the lotus that appears in various forms in society, such as the embroidery of Mon scarves, incorporates lotus patterns into the handicrafts for two main reasons: (1) The lotus is an auspicious flower used in Buddhism since ancient times, and (2) embroidering lotus patterns on Mon scarves acts as a signature for the embroiderer. When one sees the lotus symbol and the embroidery style, they can immediately identify the creator, and it also signifies the Mon heritage in Pathum Thani Province (Mrs. A, pseudonym, August 15, 2022). Additionally, adapting lotus-based food aims to attract new tourists and highlight the benefits of the lotus. This is achieved by designing and presenting food in a more modern way, such as lotus petal Miang Kham and other Thai dishes that incorporate lotus components, like lotus curry, to make the food visually appealing to tourists while promoting Pathum Thani's identity as the City of Lotus.

2.2 Economic Conditions: Capitalism has led to economic growth within communities, increasing the demand for community products that generate income for locals. Each community must therefore seek unique characteristics in their products and services that reflect their identity. This results in the reproduction of the lotus in Pathum Thani Province, highlighting the unique identity of the products while preserving and inheriting the local culture alongside maintaining the area's identity.

2.3 Policy Conditions: Policies that promote and support the reproduction of the lotus to preserve local identity are crucial for sustaining community culture. Support from the government and private sectors in areas such as career skill development, technological adaptation, and market access post-training are key drivers of this process. Collaboration between the government, private sector, and community creates a sustainable economic model, starting with the community's intent to engage in beneficial activities, with government agencies providing guidance and support. If the community lacks resources or faces challenges, relevant agencies step in to assist. The private sector, as part of the capitalist system, contributes business expertise, helping to expand the community's knowledge, while cooperating with the government to meet business needs through coordinated efforts among all three sectors.

These conditions significantly influence the conservation and inheritance of the 'Lotus' culture in Pathum Thani Province. They affect the reproduction of values and the various forms of the lotus's existence in the province. The process of inheriting the lotus culture inherently supports its conservation.

Guidelines for Conservation and Cultural Inheritance 'Lotus' Culture

Figure 1 illustrates the guidelines for the conservation and inheritance of lotus culture in Pathum Thani Province, developed based on the SWOT analysis. The figure presents a cyclical model comprising eight interconnected components essential for sustaining lotus culture: cultural inheritance, economic integration, government and private sector support, networking, community engagement, application of technology, cultural reproduction, and lotus cultivation.

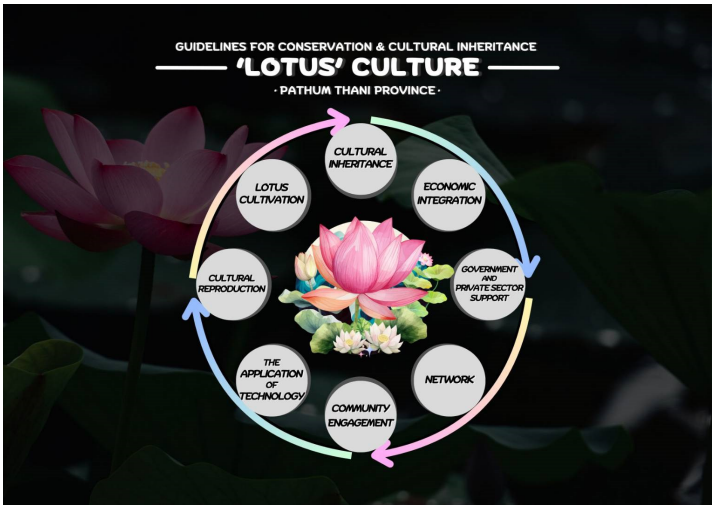

Figure 1 The guidelines for conservation and cultural inheritance 'lotus' culture lifecycle

The Guidelines for Conservation and Cultural Inheritance of the 'Lotus' Culture can be explained as follows based on the diagram.

1. There should be promotion and support for the conservation and inheritance of the lotus culture in Pathum Thani Province at all stages from the upstream, midstream, downstream to ensure sustainability.

1.1 Upstream

1.1.1 Through the inheritance of local historical knowledge about 'Lotus City,' the curriculum 'Local History' has been continuously developed to present the local history of Pathum Thani Province to local children, allowing them to learn about the origins of their province. This fosters awareness of the historical and cultural heritage that is essential to the cultural identity of the community, contributing to an understanding of the significance and cultural value of lotus in Thai culture, as well as global culture. This helps younger generations appreciate the cultural importance and meaning of the lotus.

1.1.2 Instilling a love for local cultural heritage among the youth, enabling them to incorporate culture into their lives and foster participation in preserving, nurturing, and adapting cultural practices among children and youth within and beyond the region. This encourages them to take joint ownership in cultural practices and build connections between younger generations and the elderly, as both transmitters and inheritors of culture today, ensuring sustainable cultural inheritance within the community.

1.2 Midstream

By supporting lotus cultivation in community agriculture and initiating agricultural projects that utilize lotus water, such as fish farming in lotus ponds, it helps generate income for the community and promotes lotus conservation in an agricultural context. Additionally, creating products from lotus or incorporating lotus into products, such as beauty products, health products, or food products, helps promote the use of lotus and drives cultural activities.

1.3 Downstream

Through product showcases and events, products and services become well-known and impressive to customers who are eager to purchase them. For instance, organizing art exhibitions and craftsmanship events featuring community lotus products at cultural fairs, trade shows in malls, and community learning exhibitions helps raise awareness and understanding of the significance of lotus in culture.

2. It is advisable to integrate technology in the conservation and inheritance of lotus culture. For example, Augmented Reality (AR) technology blends virtual data with the real world, providing users with a three-dimensional perspective. This enhances the interest of the younger generation in learning cultural heritage through modern technology. Additionally, AR can be utilized in museum settings, such as using media to narrate local history for community learning and showcasing community identity through museum exhibitions.

3. There should be continuous and participatory collaborative efforts supported by governmental policies, along with collaboration from communities and the private sector. This ensures efficient operations with clear objectives that contribute to the sustainable preservation of community culture. This approach

facilitates the continuous inheritance of lotus culture in Pathum Thani Province.

4. Establishing networks and conducting activities within and outside the community network fosters relationships and exchanges diverse knowledge in management and group organization. These activities promote interaction within the network, mutual assistance, and strengthen both individual groups and the overall community network, especially in the economic aspect of community development.

Discussion

Conditions Influencing the Conservation and Inheritance of the 'Lotus' Culture

The conditions influencing the conservation and inheritance of lotus culture in Pathum Thani Province highlight the importance of internal conditions, particularly the awareness of being a resident in a region known for its lotus heritage. This recognition has made the lotus a symbol strongly associated with Pathum Thani, fostering a collective memory among residents. Local history, passed down through generations, plays a vital role in shaping community identity and promoting the continuity of the area's unique culture. The awareness of social identity encourages activities aligned with this identity, reinforcing a shared understanding of oneself and others (Ashforth & Mael, 1989; Hogg et al., 1995). According to Woodward (2018), the emergence of meaning enables individuals to realize who they are and which society they belong to, ultimately shaping a collective identity within that social group. This collective identity formation is crucial for the conservation of local culture, as seen in studies such as Pongkittiwiboon (2018), which found that buffalo racing in Chonburi communicates local identity through a long history of buffalo husbandry. Similarly, Bamroongboon & Potiwan (2020) showed that the awareness of group identity influences the reproduction of cultural heritage, as seen in Maha Sarakham's 'Sroi Dokh Mak' pattern, which reflects the province's distinct cultural history. These studies emphasize that local history and identity awareness are key to preserving and perpetuating community culture.

The conditions of cultural reproduction in Pathum Thani promote awareness of local identity, as the process helps sustain cultural experiences over time. Cultural reproduction often leads to social reproduction, reinforcing values, beliefs, and ideas that ensure the ongoing inheritance of cultural heritage (Kavousy & Tohidy, 2010). Social institutions such as family, education, media, and religion play key roles in this process. Educational institutions, in particular, are vital in shaping cultural attitudes and ensuring cultural continuity (Ganjoo & Verma, 2021). Research by Kavousy and Tohidy (2010) highlights schools' role in socialization, helping to establish cultural systems and adjust values and norms. Similarly, Kang (2022) emphasizes the importance of enhancing curricula in educational institutions to drive cultural initiatives, for example, by incorporating traditional music into education and linking it to prominent music exams, thus promoting interest in cultural heritage.

Economic and political considerations are crucial in supporting efforts to protect and propagate lotus culture. Economically, communities must generate income from unique regional products or services to achieve self-sufficiency. Politically, laws that promote the sale of these goods and services are vital for empowering communities to maintain economic independence (Bamroongboon & Potiwan, 2020). A major influence on the continuation of cultural inheritance is the current trend in popular culture. Zhang et al. (2021) emphasize the importance of national policies that require cooperation across sectors, particularly when state policies support activities to conserve intangible cultural heritage (ICH). This enhances public participation and interest in cultural preservation, fostering greater awareness for protecting ICH. Other influences include inheritance modes, audience preferences, dissemination methods, and social conditions.

Guidelines for Conservation and Cultural Inheritance 'Lotus' Culture

The guidelines for conserving and inheriting lotus culture indicate diverse approaches that facilitate cultural continuity amidst changing social contexts. It is found that the most fundamental and effective long-term approach in conserving and inheriting culture is fostering a sense of cultural ownership among individuals in the community. Awareness of ownership ensures sustainable care, maintenance, and continuous inheritance (Kaewthep, 2006). The participation of all stakeholders, who take part in all phases of cultural conservation and inheritance, including planning, execution, use, benefits sharing, and evaluation, is essential to this process of communal ownership (Sthapitanonda, 2006). In addition, Kang (2022) research affirms that cultivating a sense of collective ownership in culture is an essential tactic

for preserving and advancing cultural heritage. The individual is another important consideration. Because of their innate cultural consciousness and spiritual ties to their cultural heritage, cultural ambassadors with rich cultural backgrounds are especially well-suited for serving as effective leaders in the inheritance and preservation of culture. Furthermore, the involvement of children and youth in cultural activities is a global issue today, where they often lack participation. This includes a lack of interest, awareness of their role as inheritors, motivation, and enthusiasm. Overall, children and youth generally exhibit insufficient engagement, leading to potential future deficits in cultural inheritance (Ganjoo & Verma, 2021; Kang, 2022; Wang et al., 2024; Zhang et al., 2021). Therefore, it is necessary to establish groups of inheritors who will continue to carry out these roles in the future within each community. For example, creating groups of inheritors to revive the cultural wisdom of the lotus, such as lotus farming techniques, the application of lotus products, value-added products from lotus, and so on.

Strategies to strengthen the conservation and inheritance of lotus culture amidst social changes include:

1. Inheriting local historical knowledge through developing local curriculum to learn about indigenous history and wisdom, fostering awareness of the cultural heritage's value as a cultural capital within the community. This cultural inheritance through locally responsible curricula by educational institutions is acknowledged for its pivotal role in shaping societal values transferred to students (Dolrung et al., 2017; Ganjoo & Verma, 2021).

2. Collaborative tripartite partnerships among communities, the government, and private sectors are essential for sustaining community economies and driving national development. Examples include continuous government policies supporting community-based economic initiatives (Sapathong et al., 2016) and private sector middlemen supporting market linkages. Communities serve as the production base with their unique identities. Challenges such as budget constraints, limited cultural dissemination spaces, and involvement from all age groups—children, youth, and adults—are significant barriers to sustainable community cultural heritage inheritance (Atawongsa, 2017).

3. Networking is essential and critical for cultural initiatives, both within and outside the community. The current networking for the inheritance of lotus culture involves exchanging personnel as instructors in handicrafts and lotus product manufacturing with other community enterprise groups in the province. However, the networks are not yet as robust as they should be, including group-level networks, networks with government agencies, and networks with the private sector. In alignment with Jakae (2021) emphasizing the importance of networking, such affects the inheritance of indigenous knowledge among Thai hill tribe people. It has been found that establishing group relationships through the formation of affinity groups and linking these relationships for acceptance at the network level using social and cultural capital enhances preservation of cultural traditions.

4. The use of technology in the conservation and inheritance of lotus culture: While the rise of technology and industry has contributed to challenges in cultural inheritance, leading to the potential loss of some traditions through the commodification of products (Zhang et al., 2021), this same condition has also promoted new ways of preserving culture in the modern context. For example, research by Na Nakorn & Thanapansin (2022) supports the idea that communication technology has greatly facilitated the reproduction and dissemination of cultural heritage through platforms such as Facebook, YouTube, Twitter, Instagram, and web forums. These platforms provide channels for exchanging opinions, promoting, and creating cultural trends, enabling rapid communication within the country and cross-societal interactions through streaming. Consistent with the work of Zhou et al., (2021), digital platforms and online communities play a significant role in the dissemination of traditional cultural knowledge. While the internet offers valuable opportunities for cultural revival and preservation, challenges such as the commercialization of cultural content and the risk of authenticity loss remain. Their study suggests that policies on network cultural governance could enhance efforts to inherit culture by supporting digital preservation initiatives.

Conclusion and Recommendation

The guidelines for conserving and inheriting lotus culture, a case study in Pathum Thani Province, reflect the societal values and group attitudes towards lotus in Thai society, evident in the reproduction of cultural values and the inheritance of cultural beliefs and lifestyles. The study reinforces the importance of creating awareness of identity within groups amidst the diversity of other groups, along with fostering a sense of ownership in society's culture. This underscores the sustainability of cultural identity through the replication and emphasis on the significance of one's identity through the reproduction

by various societal institutions, especially family and educational institutions, fostering awareness for conserving and responding to the continuation of their culture permanently.

Furthermore, the study, aims to highlight conditions influencing the continuous conservation and inheritance of lotus culture. This research is intended to inform the design of strategies for ongoing conservation and inheritance of lotus culture in Pathum Thani Province. The findings suggest that if we aim to preserve and pass down cultural heritage, the process of cultural reproduction is crucial for maintaining awareness, existence, and visibility within the community. Moreover, the research provides insights into avenues for addressing issues that threaten the loss of diverse community cultures, leading to more sustainable planning and strengthening of community cultural resilience.

Conflict of Interest

The authors declare that there is no conflict of interest

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Assessment of university teaching through critical analysis of student feedback

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Abstract

Student feedback has become a critical element in higher education, shaping the evolution of pedagogical strategies and academic practices. As universities increasingly emphasize student-centered approaches, understanding how faculty members perceive and respond to feedback is essential for improving teaching quality and educational outcomes. The objective of this study was to examine of faculty members' perceptions of student feedback at the Milagro State University (UNEMI). A quantitative, descriptive design was employed, utilizing stratified random sampling to collect data from 460 faculty members. A structured digital survey was used to gather responses, and data were analyzed using SPSS. The findings indicated that while student feedback is generally perceived as valuable, it is not always constructive. Direct interactions (83%) and written communication (71%) were the most common channels for feedback. Feedback moderately influenced teaching practices, with 22 percent of faculty acknowledging its contribution to teaching improvement. However, concerns about negative feedback and its potential impact on teaching methods persisted. The study concludes that institutional support is crucial for helping educators effectively interpret and apply feedback. Future research should broaden the scope to include diverse academic contexts and explore long-term feedback impact.

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Introduction

In contemporary educational systems, student feedback has emerged as a fundamental pillar in the design and implementation of pedagogical strategies across universities globally (González-Pérez & Ramírez-Montoya, 2022; Maringe & Sing, 2014). The literature has extensively documented the shift toward formalized evaluations of the educational process, with multiple studies underscoring the integration of structured feedback mechanisms supported by diverse methodological approaches (Hall et al., 2020; Marra, 2021). These formal assessments are critical for monitoring and improving teaching quality, aligning with institutional objectives, and enhancing the overall learning experience (Irons & Elkington, 2021). Furthermore, informal channels of feedback such as email, social media, and direct interactions have increasingly gained prominence, complemented traditional methods and provided real-time insights into student experiences and perceptions.

Historically, feedback in academic settings has primarily focused on the institutional perspective, emphasizing the role of evaluations in administrative decision-making and faculty development (Daniëls et al., 2019; Evans, 2013; McLaughlin & Marsh, 1978). However, a growing body of research highlights the evolution of the student's role, transitioning from passive recipients of education to active participants who increasingly view themselves as consumers of educational services (Budd, 2017; Matthews et al., 2018; Tomlinson, 2017). This shift has led to heightened expectations of quality, both at the institutional and individual faculty levels (Bovill et al., 2016; Díaz-Méndez et al., 2019; Leisyte & Dee, 2012). Consequently, universities have adopted commercial management practices to meet these expectations, occasionally prioritizing the achievement of academic credentials over substantive learning outcomes.

The problem addressed in this study lies in the tension between the increasing emphasis on student feedback and the need to maintain academic rigor. While positive feedback is often linked to administrative decisions concerning faculty hiring and compensation (Bovill et al., 2016; Díaz-Méndez et al., 2019), there is growing concern that catering excessively to student preferences could compromise educational standards. Teachers frequently encounter the challenge of balancing student suggestions with their professional judgment and curricular guidelines (Fejes et al., 2016; Wong & Chiu, 2019). This tension highlights a critical gap in current educational practices, where the quest for favorable evaluations may overshadow the intrinsic goal of higher education: to provide quality learning experiences that foster critical thinking and intellectual growth.

Despite the abundance of research focusing on student perceptions, there remains a significant gap in understanding how these evaluations impact teachers' pedagogical decisions (DeCoito & Estaiteyeh, 2022; Parsons et al., 2018). Existing studies tend to prioritize student satisfaction as a primary outcome, often neglecting the perspectives of educators who are directly affected by feedback and are responsible for implementing changes (Brew, 2010; Larsen, 2024; Sinnema et al., 2017). This gap is particularly problematic given the increasing reliance on student evaluations in faculty assessments and the potential for such feedback to influence teaching strategies, curriculum design, and professional development.

The relevance of this study lies in the central role of the Milagro State University (UNEMI) within Ecuador's higher education system. As one of the country's leading public universities, UNEMI has a structured approach to student feedback, making it a representative case for analysing how these evaluations impact pedagogical practices. Additionally, its inclusive nature in serving students from diverse socioeconomic backgrounds reinforces its commitment to continuous academic quality improvement. Examining the perceptions of UNEMI's faculty allows for an exploration of a context where the democratization of knowledge and educational excellence converge. Although international research on student evaluations is extensive, there is limited evidence regarding their impact on Ecuadorian public universities. This study seeks to fill that gap and provide valuable insights into feedback systems in higher education.

The primary research question that underpins this study is: How does student feedback influence the professional development of university faculty, particularly in maintaining academic standards? This inquiry delves into the complex relationship between meeting students' immediate preferences and upholding the rigor required for high-quality education. It explores whether the feedback provided by students can serve as a constructive tool for enhancing teaching effectiveness without diluting academic content. Furthermore, the study also seeks to answer a secondary question: What are the most effective methods for receiving and integrating student feedback into teaching practices?

To address these questions, the study has as its primary objective the examination of faculty members' perceptions of student feedback at the Milagro State University. The research seeks to understand how these perceptions shape and inform pedagogical decision-making processes within higher education institutions.

Methodology

The methodology of this study follows a quantitative approach, aiming to systematically analyze measurable data concerning the relationship between student feedback and its impact on pedagogical practices. The research adopts a descriptive design, appropriate for capturing the current perceptions of faculty members and exploring the relationships between key variables, such as student feedback characteristics and the resulting teaching decisions.

This is a non-experimental study, with no variable manipulation, focusing on the observation and measurement of naturally occurring phenomena. The level of investigation is descriptive-explanatory, aiming to both describe existing perceptions and explore the potential influence of feedback on pedagogical practices in higher education institutions.

The population of this study consisted of all full-time and part-time faculty members at the Milagro State University. The faculty members included represented various academic departments, covering a wide range of teaching roles, experience levels, and subject disciplines. This diverse population was selected to ensure that the study's findings would be applicable across different educational contexts within the university. Given the broad scope of the population, it was essential to employ a method that would capture a representative sample.

To achieve this, the study employed stratified random sampling. This technique involves dividing the entire population into distinct subgroups or strata based on a characteristic in this case, academic departments. Each stratum (department) was proportionally represented in the final sample to ensure that the diversity of the faculty was accurately reflected. Once the strata were established, random selection was conducted within each stratum to select individual participants. This method ensures that the sample is both random and representative, reducing the risk of bias and improving the generalizability of the findings.

The sample size was set at 460 faculty members, a number determined based on the total population size and the need for statistical accuracy. This number was chosen to provide enough statistical power to detect relationships between variables while maintaining a manageable data set for analysis. The stratified random sampling method ensures that this sample is representative of the broader faculty population, accounting for differences in departments, academic rank, and teaching experience. Table 1 is presented outlining the inclusion and exclusion criteria applied to the study subjects.

For data collection for Table 1, a structured digital survey was distributed via Google Forms, ensuring anonymous participation. The survey link, sent via email, included a detailed introduction explaining the study's objectives and structure. Importantly, before accessing the questionnaire, participants were presented with an informed consent form at the beginning of the survey. This allowed respondents to review the ethical considerations and give their explicit approval before proceeding with the questionnaire.

The reliability of the instrument was statistically confirmed through Cronbach's alpha, which produced a coefficient of .87, indicating a high level of internal consistency across the survey items. This statistical validation assured the robustness and reliability of the data collection tool.

The interpretation scale of the questionnaire was based on a seven-point Likert scale, designed to measure the degree of agreement or disagreement of participants with the statements presented, providing a detailed quantitative assessment of their perceptions. This scale ranged from "Strongly Disagree" (1), which reflected a strong disagreement with the statement, to "Strongly Agree" (7), which indicated a high degree of agreement. The intermediate points included "Disagree" (2) and "Slightly Disagree" (3), which represented moderate levels of disagreement, as well as "Neither Agree nor Disagree" (4), corresponding to a neutral stance. On the positive side of the scale, there were "Slightly Agree" (5) and "Agree" (6), which indicated varying degrees of agreement with the statement.

Table 1 Inclusion and exclusion criteria for participation

Criteria	Description
Inclusion Criteria	Faculty members with at least one year of teaching experience at the university. Faculty who received formal student evaluations. Faculty actively employed during the study period.
Exclusion Criteria	Faculty members in administrative roles. Faculty without formal student evaluations. Faculty on temporary contracts.

For data analysis, the responses were processed using Statistical Package for the Social Sciences (SPSS). Descriptive statistics, including means, frequencies, and standard deviations, were calculated to summarize the data. Additionally, correlational analyses were conducted to explore potential relationships between the variables of interest, providing a comprehensive understanding of how student feedback affects pedagogical decisions. Results were systematically tabulated and visualized using SPSS version 26 to facilitate clear interpretation and presentation.

Theoretical and Conceptual Framework

The assessment of university teaching through critical analysis of student feedback is a multidimensional process that integrates theoretical concepts and practical methodologies to improve teaching practices. This process is essential in higher education as it helps align pedagogical strategies with institutional quality standards. The foundation of this framework is based on three key elements: teacher evaluation, student feedback, and critical analysis. Each of these concepts provides a critical perspective for understanding how teaching performance is measured and how student input can be utilized to refine and enhance educational practices.

Teacher Evaluation

Teacher evaluation is the process by which the effectiveness and quality of a teacher's performance are measured, considering factors such as mastery of content, teaching methodology, and interaction with students (Gómez López & Valdés, 2019; Kulik & McKeachie, 1975; Tjabolo & Otaya, 2019). This evaluation is crucial for ensuring that pedagogical practices are effective and aligned with the institution's quality objectives. According to the theory of Total Quality Management (TQM), continuous improvement in educational processes is achieved through systematic assessment, helping institutions monitor and enhance teaching outcomes (Jasti et al., 2022; Kaiseroglou et al., 2024).

Teacher evaluations can be conducted through formal tools, such as structured surveys, or through informal methods like direct interactions with students (Donaldson & Firestone, 2021). Both approaches offer a comprehensive view of teaching performance, providing quantitative and qualitative data that inform decision-making. As noted by Yang (2024), this evaluation process contributes not only to improving faculty performance but also to optimizing student learning experiences.

Student Feedback

Student feedback refers to the comments and opinions that students provide regarding the teaching they receive. These inputs are essential for adjusting and improving pedagogical strategies (Carless & Boud, 2018; Wanner & Palmer, 2018). Over time, student feedback has evolved from being a passive component of the educational process to becoming a critical tool for refining teaching methods. Nel (2017) highlights that students now play a more active role, acting as critical consumers who provide valuable insights to enhance educational processes. This shift aligns with the constructivist theory of learning (Vaishali & Misra, 2020), which emphasizes the role of social interaction in the construction of knowledge.

Feedback can be obtained through formal channels, such as surveys, or through informal interactions, like verbal comments or emails. These contributions allow teachers to reflect on their practices and make necessary adjustments to improve the learning environment. As Dada et al. (2023) suggests, student feedback is key to promoting more personalized and student-centered teaching approaches.

Critical Analysis of Feedback

The critical analysis of student feedback involves a deep and reflective review of the comments received, allowing teachers to identify patterns, trends, and areas for improvement (Hallinger et al., 2014; Lee, 2017). This approach not only provides insights into student perceptions but also fosters a continuous process of improvement in teaching practices. According to Bennett (2011), critical analysis encourages reflective dialogue between students and teachers, enabling the identification of improvement areas without compromising academic standards.

Freire's critical analysis framework allows teachers to receive and contextualize feedback, adapting their practices to balance student expectations with academic goals (Ochuot & Modiba, 2018; Weninger, 2018). This reflective process is crucial for distinguishing between constructive criticism and feedback influenced by external factors, such as subjective or unrealistic student expectations (Panadero et al., 2016; Yan & Brown, 2017). By incorporating critical analysis into teacher evaluation, institutions promote an ongoing process of pedagogical adaptation and enhancement, ensuring that teaching practices evolve in response to meaningful feedback.

Results and Discussion

In this section, the findings regarding faculty perceptions of student feedback are presented and interpreted. Figure 1 illustrates the distribution of responses related to various aspects of student feedback, including its frequency, impact on teaching practices, and the attitudes of educators toward the feedback received. The results are organized based on a seven-point Likert scale, which measures the degree of agreement or disagreement with several statements about the nature and influence of student feedback.

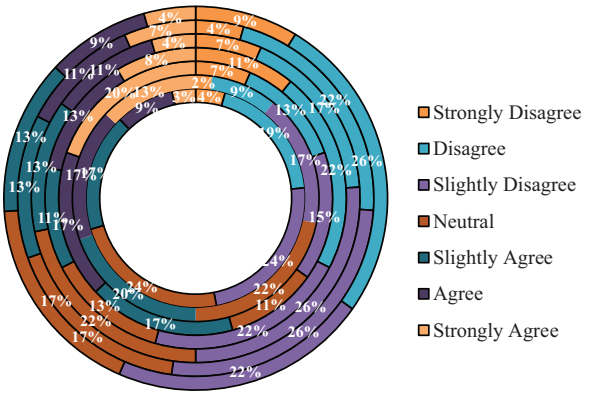

Figure 1 Student feedback

As shown in Figure 1, the data indicate that most teachers do not perceive feedback as insufficient. Specifically, 19 percent of participants slightly disagreed, 22 percent were neutral, and 19 percent disagreed with the statement that feedback is lacking. This supports Carless et al. (2023), who emphasized that the challenge with feedback often lies in its quality and specificity, rather than in its volume. While there is no strong consensus on the adequacy of feedback, the focus on enhancing its meaningfulness remains a priority.

The feedback emphasizing negative aspects shows a moderate tendency, with 22 percent agreeing and 26 percent slightly agreeing, while 17 percent remained neutral. This aligns with the findings of Harvey and Green (2022), who noted that negative feedback can disproportionately impact teachers' perceptions and their teaching strategies. The belief that feedback reflects the views of the entire student body was supported by 17 percent agreeing and 19 percent strongly agreeing, though Carey (2013) cautions that feedback can sometimes be skewed by more vocal students, raising questions about its representativeness.

Regarding the tone of feedback, 22 percent disagreed, 20 percent slightly disagreed, and 24 percent remained neutral on whether it was respectful and friendly, showing variability in experiences. Van der Kleij (2019) emphasized the importance of respectful feedback in fostering constructive communication between students and teachers. Additionally, feedback was seen as moderately influencing teaching, though not as the dominant factor, with 22 percent slightly disagreeing and 26 percent remaining neutral. Huang and He (2023) noted that feedback is just one of many factors educators consider when adjusting their teaching methods. Finally, although feedback contributes to teaching improvement, the degree of its impact remains limited, with Ryan et al. (2024) emphasizing the need for clear and actionable feedback to enhance its effectiveness.

The results of this study present a comprehensive analysis of the various sources of feedback received by university faculty. Table 2 provides an overview of the different channels through which feedback was delivered, highlighting the frequency of each source and the percentage of faculty members who received feedback through these mediums. The results offer insight into the preferences and behaviors of both students and educators when it comes to providing and receiving feedback, revealing trends in communication and interaction patterns.

The results reveal that the most frequently utilized channels for feedback are direct interactions and written communication, with 83.0 percent of teachers receiving feedback through face-to-face interactions and 71.1 percent via emails or course site messages. This preference for informal, immediate communication underscores the value placed on direct engagement between teachers and students, as real-time feedback facilitates prompt pedagogical adjustments (Lee et al., 2023). The high percentage of teachers relying on direct interactions highlights the importance of personal rapport and constructive feedback in educational settings.

In contrast, course evaluations, despite being more formalized and structured, are less frequently used, with only 29.8 percent of teachers receiving feedback through this method. This aligns with the findings of Fawns and Sinclair (2021), who suggest that course evaluations often lack actionable insights and may not fully capture the complexities of teaching effectiveness. The relatively low use of course evaluations may indicate a preference among faculty for more immediate and personalized feedback mechanisms, which are perceived as more effective for fostering improvements.

Table 2 Sources of feedback and faculty reception

Source of Feedback	Feedback (%)	Percentage of Teachers Who Received (%)	Total Number of Responses	Interpretation
Course evaluations	19.0	29.8	87	Feedback through course evaluations was received by 29.8 % of teachers, indicating moderate participation in this formal channel.
Written communication (emails or course site messages)	32.1	71.1	147	Written communication is the most common source of feedback, utilized by 71.1 percent of teachers, reflecting a preference for less formal channels.
Telephone conversations	4.8	47.0	22	Telephone conversations provided feedback to a smaller number of teachers, accounting for only 4.8 percent of the total responses.
Direct interactions (feedback at events or office visits)	38.1	83.0	175	Direct interactions are the most utilized source of feedback, with 83.0 percent of teachers reporting feedback received through personal interactions or events.
Other sources (please specify)	6.0	18.2	29	Other unspecified sources represented a smaller proportion of feedback received, with 18.2 percent of teachers reporting these channels.
Cumulative total	100.0	-	460	The total responses are distributed across various feedback sources, with direct interactions and written communication being the most prominent.

Telephone conversations, accounting for only 4.8 percent of feedback, demonstrate a low preference for this medium. As noted by Dawson et al. (2023), the effectiveness of feedback is closely linked to the medium used, with more direct forms being more impactful. Additionally, other channels, such as social media or peer evaluations, reported by 18.2 percent of teachers, remain marginal. These findings align with the broader diversification of communication tools in academic contexts, though their role in formal feedback processes remains limited, as described by Smith (2021).

This section presents the analysis of how student feedback contributes to changes in various aspects of teaching practices, focusing on adjustments in content delivery, teaching methods, and difficulty levels, as seen in Figure 2. The data highlight how faculty perceive and integrate student evaluations into their pedagogical strategies, with varying levels of agreement or disagreement across multiple areas.

As illustrated in Figure 2, the analysis of whether content should be decreased revealed that 26 percent of participants responded neutrally, while 20 percent slightly agreed, and 22 percent agreed with reducing content. This suggests that a significant portion of teachers supports limiting the amount of material covered in classes to allow for a more in-depth exploration of key topics. Schindler et al. (2017) observed that reducing content breadth in favor of depth enhances student comprehension and retention, as it provides more time for critical analysis and engagement with core concepts. This trend reflects a broader shift in higher education toward prioritizing quality over quantity in teaching practices.

Conversely, the notion of increasing content was met with considerable opposition, with 26 percent of respondents strongly disagreeing and 22 percent disagreeing. Only 15 percent expressed support for increasing content in their teaching. This resistance aligns with the findings of Lee and Martin (2020), who warned that content overload can overwhelm students and impede their ability to focus on essential learning objectives. The reluctance to expand content suggests that educators are increasingly aware that excessive material may lead to superficial learning rather than deep understanding, highlighting a preference for more focused instruction.

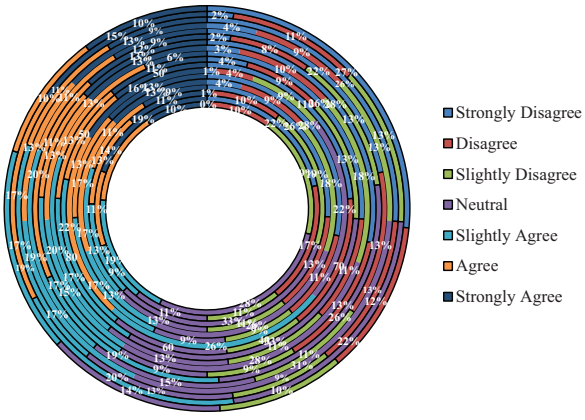

Figure 2 Contribution of student feedback to teaching practices

Regarding traditional lecturing, responses were divided, with 20 percent disagreeing with reducing lectures and 17 percent slightly agreeing with increasing them. This division reflects ongoing debates about the role of traditional lectures in modern pedagogy. While lectures are effective for delivering large volumes of information, they are often critiqued for their lack of interactivity. Sivarajah et al. (2019) highlighted the shift toward more participatory teaching styles that challenge the dominance of lectures. Despite this, the data indicate that some educators still advocate for traditional lectures, particularly in fields where structured content delivery is crucial.

The responses to tutorial sessions and lab exercises also showed varying perspectives. While 22 percent slightly agreed on increasing tutorials, 26 percent favored reducing them, indicating a split in how educators view the role of personalized instruction. Hill and West (2020) emphasized that tutorials provide opportunities for individualized feedback, but their frequency must be carefully managed. Similarly, 17 percent of respondents supported increasing lab exercises, and 15 percent agreed with reducing them. Viegas et al. (2018) stressed the importance of labs in reinforcing theoretical knowledge through hands-on experience, though a balance with theoretical instruction is necessary for comprehensive understanding.

As presented in Figure 3, this section introduces the results of teachers' perceptions regarding the contributions of student feedback to changes in their teaching practices. The results demonstrate how feedback influences various pedagogical decisions, from content modification to adjustments in lecturing and group work.

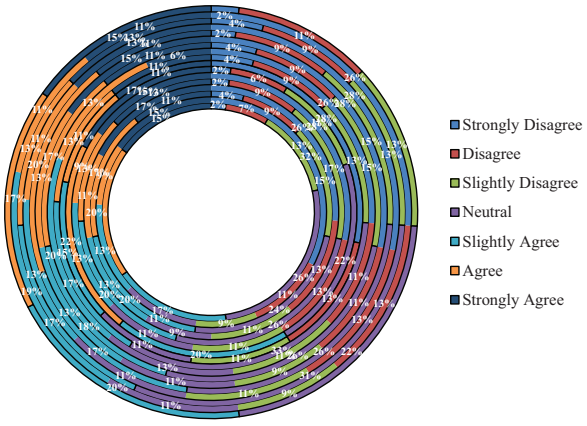

Figure 3 Feedback contributions to changes in teaching practices

As illustrated in Figure 3, the data illustrate the varying adjustments educators make in response to student feedback across areas such as content, teaching methods, tutorial sessions, lab exercises, industry lectures, and case studies. A notable 26 percent of participants agreed they had reduced content based on feedback, reflecting a broader trend toward a more streamlined curriculum. This aligns with Billett and Martin (2018), who argued that reducing content allows students to engage more deeply with key concepts. In contrast, the idea of increasing content was met with resistance, with 22 percent disagreeing, indicating concerns about cognitive overload, as emphasized by Uus et al. (2020).

Regarding teaching styles, the shift away from traditional lecturing methods is evident. While 20 percent of participants agreed with reducing traditional lecturing, 22 percent remained neutral, reflecting a moderate preference for less traditional approaches. Cendon (2018) highlighted the increasing trend toward interactive teaching, which encourages greater student engagement. Additionally, over 25 percent slightly disagreed with increasing traditional lecturing, reinforcing the move toward dynamic instructional methods that offer more interactivity and participation.

The responses concerning tutorial sessions and lab exercises reveal ongoing debates. While 20 percent supported increasing tutorial sessions, 13 percent disagreed, showing mixed opinions on the role of personalized instruction versus group learning. Pennington et al. (2021) pointed out the value of individualized feedback in tutorials, though the resource-intensive nature of such sessions may explain the division. Similarly, opinions on lab exercises were split, with 20 percent agreeing on increasing them and 15 percent supporting a reduction. Björck (2020) emphasized the importance of lab work and industry lectures in bridging theory and practice, further validating the role of practical learning in academic settings.

This section presents the findings regarding teacher attitudes and reactions to receiving student feedback. Figure 4 provides a visual representation of how educators respond emotionally and behaviorally to feedback, including their level of agreement or disagreement with various statements related to feedback's role in shaping teaching practices and decisions.

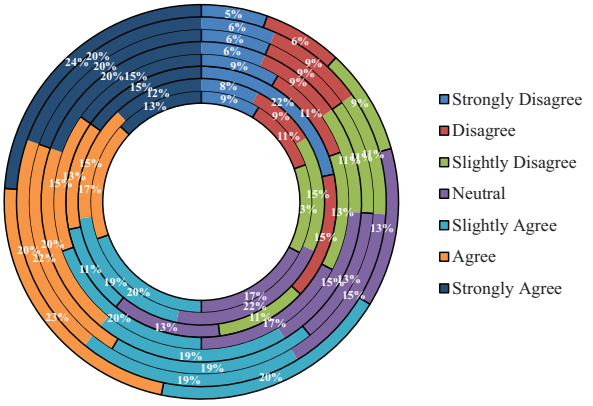

Figure 4 Teacher attitudes and reactions to student feedback

As illustrated in Figure 4, the data highlight diverse teacher reactions to student feedback, ranging from positive anticipation to anxiety. Specifically, 40 percent of teachers either disagreed or strongly disagreed with feeling happiness or curiosity before receiving feedback, while 60 percent agreed or strongly agreed, indicating a generally positive disposition toward feedback. This aligns with Hammer et al. (2018), who found that teachers with positive attitudes toward feedback are more likely to improve their teaching quality. However, 35 percent of teachers reported experiencing nervousness or anxiety before receiving feedback, which supports Hill et al. (2021), who noted that feedback can evoke emotional responses, particularly due to perceived criticism.

Regarding the significance of positive feedback, responses were mixed. While 100 participants strongly disagreed with its importance, 70 agreed or strongly agreed that receiving positive feedback was essential. This reflects a balance between teachers who are intrinsically motivated and those who may rely on external validation from students. Vermote et al. (2020) pointed out that dependence on positive feedback can be both motivating and detrimental, as it may lead teachers to avoid making necessary teaching changes in response to negative feedback, which could ultimately hinder their professional growth.

Interestingly, 30 percent of teachers admitted to avoiding beneficial changes in their teaching due to fear of negative feedback, consistent with Flodén (2017), who emphasized the potential compromises in teaching integrity when educators modify their strategies to secure favorable student evaluations. Conversely, 60 percent of teachers indicated they never avoided making necessary changes based on feedback concerns, demonstrating a division in how feedback impacts pedagogical decisions. Furthermore, 25 percent strongly disagreed with including non-essential elements to receive positive feedback, with 90 percent reporting they never made such adjustments, echoing Winstone and Carless's (2021) caution against compromising educational quality to appease student preferences. These findings illustrate the complex and varied ways feedback influences teaching practices and decision-making.

The results obtained reflect teachers' perceptions of different evaluation methods based on student feedback. Figure 5 presents a detailed visual representation of the levels of agreement or disagreement regarding modifications in evaluation methods, such as reducing or increasing traditional written exams, group work, individual reports, and oral presentations.

As illustrated in Figure 5, the data indicate a strong preference for maintaining traditional written exams, with 70 percent of respondents disagreeing with the notion that such exams have been reduced. This finding is consistent with Alam et al. (2021), who argue that institutions often retain traditional assessment methods due to their structured nature and ease of performance measurement. Despite ongoing discussions about diversifying evaluation methods, written exams remain a central component in many educational settings.

In contrast, there is a clear interest in increasing collaborative learning methods such as group work and case studies, with 70 percent of participants slightly inclined toward expanding these practices. This trend aligns with constructivist theories (Moreira-Choez et al., 2023; Rodriguez-Salvador & Castillo-Valdez, 2023), which emphasize the value of teamwork and collaboration in modern education. Furthermore, 50 percent of teachers support the increase of oral exams and presentations, reflecting a shift toward interactive assessment methods that focus on communication skills (Bin Mubayrik, 2020; Zeng et al., 2018). Additionally, 60 percent of respondents indicated a rise in alternative evaluation strategies, highlighting a move toward more diverse and student-centered assessment approaches (Farrow et al., 2024; Kong & Wang, 2024; Wang, 2023).

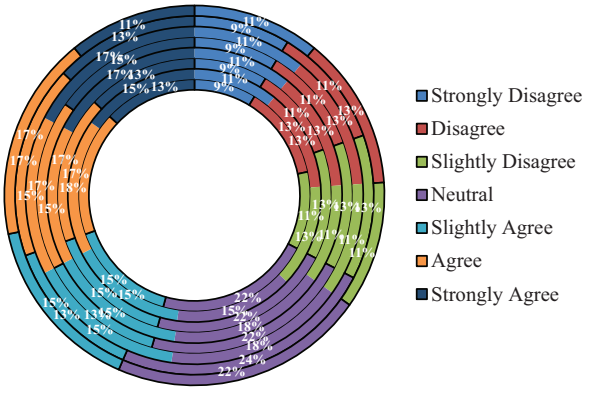

Figure 5 Teacher perceptions on evaluation methods

Conclusion

Evaluating student feedback and its influence on teaching practices has become a relevant topic in academia. Understanding how teachers perceive and apply this feedback is crucial for improving both teaching methods and educational outcomes. The main purpose of this study was to examine faculty members' perceptions of student feedback at the Milagro State University regarding the feedback received from students and its impact on pedagogical decision-making.

The findings of the study confirm that the research questions were addressed. The first question, regarding how student feedback influences professional development, was answered through data showing that although feedback is generally considered valuable by most teachers, its application in practice is inconsistent. Teachers tend to incorporate feedback into their methodology when it is constructive and presented in a respectful manner, underscoring the importance of both the content and tone of the feedback. However, many participants indicated a reluctance to make substantial changes to their teaching practices due to fear of receiving negative feedback, which ultimately limits the potential for student evaluations to drive significant pedagogical transformation.

The second research question, concerning the most effective methods for receiving feedback, revealed that direct interactions and written communication are the most frequently used channels, with 83 percent of teachers reporting feedback through face-to-face encounters and 71 percent through emails or course site messages. This highlights a preference for more immediate, informal modes of communication, although concerns were raised about the focus on negative aspects in the feedback, which contributes to teacher anxiety and resistance to change.

Despite the insights gained, the study has limitations, notably the focus on a single institution, which may restrict the generalizability of the findings to other academic settings. Additionally, the reliance on self-reported data could introduce biases, as faculty may have portrayed their experiences in a more favorable light. Future studies should aim to include a wider range of institutions and employ qualitative methods, such as interviews, to provide deeper insights into how feedback is interpreted and utilized by educators.

Moreover, future research could explore the role of institutional support in aiding teachers to effectively process and apply student feedback. Longitudinal studies would also be valuable to examine the long-term effects of feedback on teaching efficacy, contributing to a more comprehensive understanding of the relationship between student evaluations and educational improvement.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Integration of TPACK Model in Islamic Religious Education Curriculum: An Analysis of Readiness and Barriers

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Abstract

Over the past decade, rapid technological advancements have significantly impacted various sectors, including education. In the context of Islamic religious education, integrating technology presents both opportunities and challenges, necessitating a comprehensive understanding of how to effectively blend technology with teaching content and values. However, research on the readiness and obstacles in implementing the TPACK model within the Islamic religious education curriculum is still limited. This study utilized a qualitative approach with case studies of five senior high schools in Pekanbaru to explore these issues. The results show significant variations in technology adoption and teacher readiness across the schools. Key factors in overcoming technological challenges include institutional support and professional training, with some schools achieving success through long-term investments in immersive technologies like AR and VR. These findings highlight the importance of adaptive and innovative approaches to address technological barriers in education. Theoretically, this study enhances the literature by providing empirical evidence on the crucial role of institutional support and professional training. Practically, it offers guidance for educational institutions to improve teacher and student readiness for technology integration. Although the study is limited by its small sample size, it provides valuable insights and recommends future research to explore new educational technologies further. Continuous investment in educational technology, sufficient professional training, and strong institutional support are essential for effective technology integration in Islamic religious education. These findings contribute to both theoretical understanding and practical applications, offering solutions to enhance educational quality through technology.

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Introduction

In the last decade, technology has undergone rapid development, significantly impacting various sectors, including education (Muhaimin et al., 2019). Usage of skill in the education and studying process not only supports more interactive and engaging learning activities but also allows access to extensive and varied learning resources (Saputra & Margana, 2023). Therefore, the combination of technology in learning has become a major focus in efforts to enhance the quality and value of learning. The availability of enlightening software, e-learning platforms, and other digital tools offers educators the opportunity to design more adaptive and personalized learning.

The TPACK model, which stands for Knowledge of technology, pedagogy and content, has emerged as an Important area that describes the competencies required by teaching staff, effectively Technological integration in teaching (Fakhriyah et al., 2022). The model brings together three main domains of knowledge: technology, pedagogy, and subject content (Astuti et al., 2023). The TPACK framework emphasizes that mastery of technology alone is not enough. Teachers also need to understand how technology can support effective teaching strategies and how it can be applied to teach subject content in greater depth. This shows that it is important a holistic method in teacher training so that Use of technology in learning becomes more meaningful.

Especially in Islamic religious education, the application of the TPACK model has its own nuances that present both challenges and opportunities. Islamic religious education teaches not only about faith and worship but also values, ethics, and ways of life that must be integrated into daily life (Lie et al., 2023). The use of technology in Islamic religious education can be an effective tool to reach students in innovative and relevant ways, in tune with their dynamic needs (Habibi et al., 2023). However, to achieve this, it requires a deep understanding of how technology can be integrated not only in teaching content but also in applying values and ethics in learning.

In an effort to enrich the literature related to integrating Technological Pedagogical Content Knowledge Model (TPACK) education curriculum, several studies have contributed significant understanding to this topic. Kristiawan et al. (2022), in an article titled "Impact of Call Professional Development for EFL Materials on Teacher Agency and Technological Pedagogical Content Knowledge (TPACK) in Indonesian Islamic Schools," explored the utilization of technology in English as a Foreign Language (EFL) learning in Islamic schools in Indonesia. The study found that through professional development workshops, EFL teachers in Islamic schools improved their ability to develop teaching materials that integrate technology and pedagogy, while incorporating their cultural and religious backgrounds.

Meanwhile, Umbase (2023) in his research entitled "Implementing Technological Pedagogical and Content Knowledge from the Social Studies Learning Management Perspective" revealed that teachers' executive information and services in utilizing TPACK are still in the reasonable group and manage to be lacking. This descriptive qualitative research suggests the importance of continuous training, technical guidance and internships to improve teachers' managerial abilities in implementing TPACK, especially in Social Studies learning. On the other hand, Priyanti (2019) in her research entitled "Influence methods of training for competence of technological pedagogical and content knowledge for (TPACK) PAUD teachers in Banten province" shows that training methods have a significant influence on the capability of TPACK/PAUD educators in Banten Province. Through the multistage cluster sampling method, it was found that the competency scores of teachers who underwent the coaching training method were higher than those who followed the mentoring method.

Studies have shown that factors such as infrastructure readiness, access to technology resources, and teacher training have a major influence on the success of technology integration in learning. The readiness of technology infrastructure in schools, such as the accessibility of computer hardware and software, stable net connection, and technical support, are basic prerequisites that must be met (Purnama et al., 2023). In addition, teachers need to be equipped with adequate training to optimize the use of these technologies in learning (Bahri et al., 2020). This training is not only about how to use technology tools, but more importantly how to integrate the technology into effective and engaging learning designs.

Although the importance of technology integration in education has been widely discussed, there are still research gaps, especially related to the readiness and obstacles in implementing the TPACK model in the Islamic religious education curriculum (Bahri et al., 2020). This raises questions about how schools and teachers can overcome these barriers and what are effective strategies to improve teachers' readiness to integrate technology in Islamic learning. Therefore, further research in this area will not only help identify the challenges faced by teachers and schools, but also provide insights into best practices and recommendations for effective employment of the TPACK model in the setting of Islamic spiritual teaching.

However, in practice, the addition of knowledge in education, especially in the field of Islamic spiritual teaching, is often hindered by the availability of inadequate resources and infrastructure (Gloria & Anugrah, 2021). Schools, especially in remote areas or with limited funding, may not have access to the necessary hardware and software to effectively implement technology-based learning (Hidayah et al., 2020). In addition, unstable or slow internet connectivity can reduce the effectiveness of using knowledge in education. This condition makes it difficult for teachers to integrate technology in the curriculum and present innovative and interactive learning materials, so the potential use of technology in Islamic religious education cannot be fully maximized.

Furthermore, there is often an unavailability of the necessary training to integrate technology in the learning process, leaving some teachers without adequate support (Aniq et al., 2022). This shortcoming suggests that professional training in the utilization of educational technology is still uneven, with some teachers receiving comprehensive training while others do not. As a result, teachers who do not receive adequate training feel less confident and competent in applying technology to support the learning process, especially in Islamic subjects. This creates disparities in the quality of learning offered to students and poses challenges in achieving effective and efficient TPACK integration across educational institutions.

On the other hand, previous research has not specifically identified the barriers and challenges faced by Islamic religion teachers in integrating technology into the curriculum, creating a gap in the academic literature (Wijayanto et al., 2023). While there have been studies on the use of technology in education in general, research focusing on the context of Islamic religious education is limited. This shortcoming points to the need for more targeted research to understand the specificity of the challenges and barriers to technology integration in Islamic religious education. Without an in-depth understanding of this specific context, efforts to formulate effective strategies or solutions to overcome these challenges will be less targeted.

The lack of understanding of how to effectively integrate religious values with the use of technology in learning is a problem in itself. The integration of religious values in technology-based learning requires a deep understanding of how technology can be used to not only deliver content, but also to facilitate learning experiences that enrich the understanding and practice of religious values. Without a clear strategy to combine these two aspects, the use of knowledge in Islamic spiritual teaching may not be fully effective in achieving the desired learning objectives. Therefore, further research is needed to develop and evaluate methods that enable harmonious integration of technology and religious values in the curriculum.

Likewise, there is little empirical evidence indicating the best strategies to overcome these challenges in the context of Islamic religious education. This marks a gap in existing knowledge, where a lack of empirical data makes it difficult to determine the most effective approaches to overcoming barriers to technology integration in religious education. In-depth and focused empirical studies are needed to gather evidence on best practices that can support teachers and educational institutions in effectively integrating technology, especially in teaching Islamic religion.

The position of knowledge addition in Islamic spiritual teaching is becoming increasingly urgent along with the advancement of information and communication technology (Sastradika & Defrianti, 2021). The lack of research that specifically examines the barriers and challenges in integrating the TPACK model in Islamic religious education marks an urgent need for an in-depth study in this area. The gaps in the existing literature, especially related to effective strategies to overcome barriers to technology integration, make this study very important. The findings from this study are expected to provide solutions to the problems educators face in integrating technology in Islamic religious teaching. By deeply understanding the challenges faced and identifying effective coping strategies, this research aims to enrich the knowledge and practice of technology-based Islamic religious education.

Therefore, this study aims to explore the readiness and barriers in the integration of the TPACK model in the Islamic religious education curriculum in senior high schools. Specifically, it seeks to identify the factors that influence the readiness of institutions and teachers in adopting educational technology, as well as the barriers faced in the integration process. In addition, this study aims to formulate strategic recommendations that can support teachers' professional development and the improvement of technology infrastructure in schools. Thus, the results of this study are expected to provide new and practical insights that can be used by schools to improve the effectiveness of teaching Islam through the use of technology. This research also aims to enrich the academic literature with empirical data and in-depth analysis on the application of the TPACK model in the context of Islamic religious education.

Theoretical Framework

Theoretical Framework for Integrating the TPACK Model in Islamic Religious Education will explain how to integrate the Technological Pedagogical and Content Knowledge (TPACK) model with the principles of Islamic

religious education. This framework will guide educators in effectively integrating technology into Islamic religious education, thereby improving teaching and learning.

The TPACK model consists of three interconnected components:

1. Technology Knowledge (TK)
2. Pedagogical Knowledge (CP)
3. Content knowledge (CK)

Integrating TPACK into Islamic Religious Education will take into account:

- TK: Using tools, platforms and digital resources for Islamic education
- PK: Implementing effective teaching methods and strategies in Islamic education
- CK: Understanding Islamic content, values and principles

The framework would likely include:

- Islamic principles and values
- TPACK components
- Pedagogical approaches
- Technology integration
- Learning objectives and outcomes
- Assessment and evaluation

This integration aims to improve the teaching and learning of Islamic religious education, so that it is more interesting, effective and relevant for today's students.

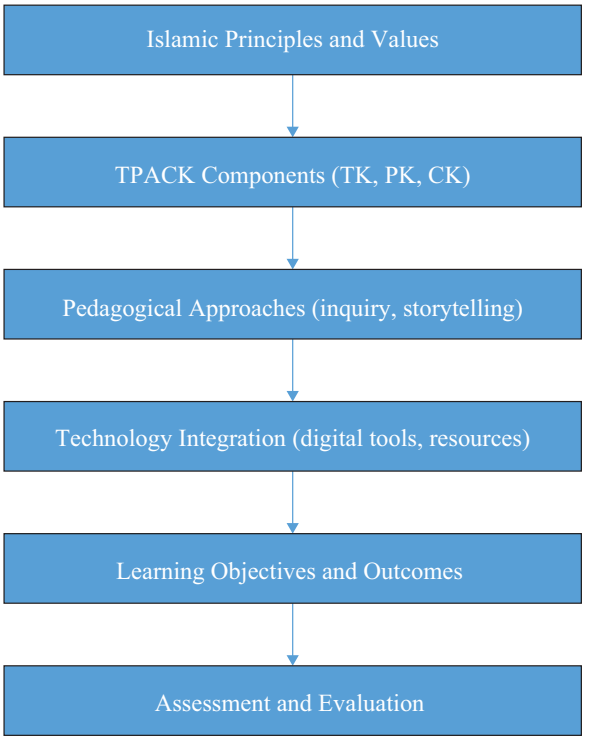

Figure 1 Conceptual Framework

Methodology

Research Design

The research design used in this study is qualitative, with example studies in five universities, i.e., SMA Negeri 12 Pekanbaru, SMA Negeri 2 Pekanbaru, SMA Negeri 7 Pekanbaru, SMA Negeri 13 Peekanbaru and SMA Negeri 14 Peekanbaru. The objective of this research is to analyze technological and pedagogical knowledge and the barriers and organization of content integration (TPACK) model in the Islamic Religious Education curriculum in these schools (Mills, 2019).

Data Collection

Five senior secondary schools were selected as research sites, reflecting geographical diversity, school size, and implementation of educational technology. Site selection criteria were based on variations in the use of educational technology and commitment to teacher professional development in the context of TPACK (Padgett, 2017). The population in this study consisted of principals and teachers in five senior high schools involved in teaching Islamic Religious Education. The selected respondents included 5 principals and 15 teachers, each of whom provided a unique perspective on the implementation and challenges of the TPACK model in their school environment. The instruments used in data collection included in-depth interviews, participatory observation, and document analysis (Berg, 2001). Interviews were conducted both face-to-face and online, depending on respondent availability and preference.

Data Analysis

The interview protocol was designed to explore respondents' perceptions, experiences, and strategies in integrating educational technology based on the TPACK model. Participatory observation was conducted to verify and complement data from interviews, while document analysis included a review of lesson plans, digital learning materials, and school policy documents (Prasojo et al., 2020). The data collection process lasted for three months, followed by qualitative data analysis to identify key themes related to readiness and barriers to the integration of the TPACK model.

Instruments

The instruments used in data analysis included qualitative data analysis software such as NVivo to assist in the organization and coding of data. The analysis technique employed was thematic analysis, where the collected data were broken down into key themes relevant to the study. These themes were then interpreted to uncover significant patterns and relationships concerning the readiness and obstacles in the integration of TPACK. Data triangulation was conducted by comparing results from various data sources to ensure the validity and reliability of the findings.

Results

This study analyzed the readiness to integrate the Technological Pedagogical and Content Knowledge (TPACK) model into the Islamic Religious Education curriculum in five senior high schools in Pekanbaru city. The results of interviews with school principals and observations of technology infrastructure revealed significant variations in technology adoption and teacher readiness. SMA Negeri 12 Pekanbaru and SMA Negeri 2 Pekanbaru highlighted the importance of institutional support and professional training in overcoming the challenges of technology integration. In contrast, SMA Negeri 7 Pekanbaru and SMA Negeri 13 Pekanbaru emphasized that professional development and teacher collaboration are key to improving teacher and student readiness. Uniquely, SMA Negeri 14 Pekanbaru demonstrated a long-term commitment to educational technology investment using immersive technologies such as Augmented Reality (AR) and Virtual Reality (VR). These findings indicate strategic differences in each school's approach to TPACK integration, underscoring the importance of adaptation and innovation in addressing technological and resource barriers in education.

The study also explored teachers' perceptions and attitudes towards the integration of the TPACK model in the Islamic Religious Education curriculum. Interviews with school principals revealed that teachers generally had positive perceptions of technology integration, with many welcoming the use of technology as a tool to enhance the learning process. The majority of teachers at SMA Negeri 12 Pekanbaru and SMA Negeri 2 Pekanbaru felt that technology enriched the learning process, although there were concerns regarding technical challenges and the need for further training. On the other hand, teachers at SMA Negeri 14 Pekanbaru were enthusiastic about the potential of technology in learning but were concerned about the time required to prepare technology-based materials. SMA Negeri 7 Pekanbaru showed a high level of acceptance of new technology, particularly in teaching geography and art, with some teachers emphasizing the importance of training and time for further exploration of technology. Meanwhile, teachers at SMA Negeri 13 Pekanbaru viewed technology integration as an important step towards modern education but had concerns about accessibility and the digital divide among students. Additionally, there were doubts among senior teachers regarding the effectiveness of technology compared to traditional methods in some schools.

In this study, the readiness in integrating the Technological Pedagogical and Content Knowledge (TPACK) model in the Islamic Religious Education curriculum in five senior high schools in Pekanbaru city was analyzed. The following are data from interviews with school principals and observations of technology infrastructure that show variations in technology adoption and teacher readiness (Table 1).

Table 1 shows a comparative overview of technology adoption and teacher readiness across five senior high schools in Pekanbaru. Furthermore, interviews with school principals revealed teachers' perceptions of the integration of technology in the Islamic Religious Education curriculum in senior high schools.

Table 1 Variations in Technology Adoption and Teacher Readiness

No	School Name	Number of Teachers	Technology Used	Readiness
1	SMA Negeri 12 Pekanbaru	78	Microsoft PowerPoint, Canva, Video	Professional Training, Technology Resources
2	SMA Negeri 2 Pekanbaru	66	Edmodo, Google Forms, Padlet	Institutional Support, E-Books, and Digital Materials
3	SMA Negeri 7 Pekanbaru	52	Tinkercad, Scratch, Microsoft Teams	Technology Infrastructure, Professional Training
4	SMA Negeri 13 Pekanbaru	34	Kahoot!, Zoom, Blogs	Teacher Collaboration, Access to Technology
5	SMA Negeri 14 Pekanbaru	66	Google Earth, Virtual Simulation, Adobe Spark	Augmented Reality (AR) and Virtual Reality (VR), Professional Training

Source: Data processed in 2024

For example, in SMA Negeri 12 Pekanbaru and SMA Negeri 2 Pekanbaru, the majority of teachers felt that technology enriches the learning process. However, there are concerns about technical challenges and the need for further training. Likewise, SMA Negeri 7 Pekanbaru showed a high level of acceptance of new technology, especially in teaching geography and art, with an emphasis on the importance of training and time for further exploration of technology.

On the other hand, teachers at SMA Negeri 14 Pekanbaru are enthusiastic about the potential of technology in learning but are concerned about the time needed to prepare technology-based materials. While teachers at SMA Negeri 13 Pekanbaru feel that technology integration is an important step towards modern education, there are concerns regarding accessibility and the digital divide among students. Concerns from senior teachers about the effectiveness of technology versus traditional methods are also a concern.

As for the barriers in implementing the TPACK model, this study identified the challenges and mitigation efforts made by the five schools in adopting educational technology as shown in Table 2.

Table 2 shows the main challenges faced by each school and the corresponding strategies implemented to overcome these barriers, thereby supporting the effective integration of the TPACK model in the Islamic Religious Education curriculum. Furthermore, the study also explored the professional development initiatives adopted by the five schools to support the integration of the TPACK model in the Islamic Religious Education curriculum shown in Table 3.

Table 3 summarizes the professional development initiatives implemented by the five senior high schools in Pekanbaru to enhance teachers' competencies and readiness for integrating the TPACK model in Islamic Religious Education. The table highlights training programs, collaborative studies, certification efforts, workshops, and leadership development activities aimed at strengthening both pedagogical and technological skills among teachers.

Discussions

Discussion of the results of this study shows that the integration of the TPACK model in the Islamic Religious Education (PAI) curriculum in schools in Pekanbaru requires special attention to technological readiness and institutional support. Based on the findings, institutional support and professional training are the main keys in overcoming technological challenges. This is in accordance with the opinion of Kristiawan et al. (2022) who emphasized the importance of contextual support in TPACK implementation. SMA Negeri 12 Pekanbaru and SMA Negeri 2 Pekanbaru emphasized the importance of professional training to ensure teachers are ready to adopt technology in learning. Thus, this study fills the gap of specific research that focuses on the integration of the TPACK model in PAI curriculum by providing empirical evidence on the importance of institutional support and professional training.

Barriers and challenges in technology integration often relate to infrastructure limitations and teacher readiness. The results show that variations in technology adoption and teacher readiness are strongly influenced by institutional and professional support. This opinion is supported by research conducted by Widowati et al. (2020) who emphasized that external factors such as administrative support and adequate infrastructure are

Table 2 Challenges and mitigation efforts

No.	School Name	Barriers	Mitigation Efforts
1	SMA Negeri 12 Pekanbaru	Lack of specific technology training	Organize monthly technology workshops
2	SMA Negeri 2 Pekanbaru	Limited IT infrastructure	Improving IT infrastructure and devices
3	SMA Negeri 7 Pekanbaru	Teacher resistance	Initiate technology sharing and demonstration sessions
4	SMA Negeri 13 Pekanbaru	High cost of new technology	Seeking sponsorship and assistance from alumni
5	SMA Negeri 14 Pekanbaru	Teacher workload and time	Optimizing the use of time and teacher rotation

Source: Data processed in 2024

Table 3 Professional development initiatives

No.	School Name	Professional Development Initiatives
1	SMA Negeri 12 Pekanbaru	Training on technology integration in learning through online and face-to-face workshops
2	SMA Negeri 2 Pekanbaru	Collaborative study in curriculum development using group discussion and literature review methods
3	SMA Negeri 7 Pekanbaru	Professional certification program to strengthen teachers' credibility and professional competence
4	SMA Negeri 14 Pekanbaru	Workshop on creativity and innovation in learning through workshops and simulations
5	SMA Negeri 13 Pekanbaru	Development of educational leadership and classroom management through seminars and leadership training

Source: Data processed in 2024

crucial in overcoming technological barriers. SMA Negeri 7 Pekanbaru and SMA Negeri 13 Pekanbaru emphasize the importance of collaboration among teachers and professional development to improve teacher and student readiness. These findings make a significant contribution in identifying the barriers and challenges faced by PAI teachers in integrating technology.

The best strategies to overcome barriers in the context of Islamic religious education require adaptive and innovative approaches. This research shows that SMA Negeri 14 Pekanbaru has successfully demonstrated a long-term commitment to investment in educational technology, including the use of immersive technologies such as Augmented Reality (AR) and Virtual Reality (VR). This approach is in line with the theory of Allcott et al. (2019) which states that technological innovations can be effectively adopted through a systematic and sustainable approach. Thus, this study fills the lack of empirical evidence on the best strategies to overcome barriers in Islamic religious education by demonstrating the importance of long-term technology investment and innovation.

The integration of religious values with the use of technology in learning is an important aspect that needs attention. The results showed that teachers in SMA Negeri 12 Pekanbaru and SMA Negeri 2 Pekanbaru generally have a positive perception of technology integration, seeing it as a tool to improve the learning process. This is in line with the opinion of Mukminin & Habibi (2020) who state that technology can be used to support educational values if integrated properly. However, there are concerns regarding technical challenges and the need for further training. This research provides insight into how to integrate religious values with the use of technology in learning, which was previously poorly understood.

This research also shows that technology adoption in schools in Pekanbaru varies depending on the level of acceptance and readiness of teachers. Teachers at SMA Negeri 7 Pekanbaru showed a high level of acceptance of new technology, especially in teaching geography and art. This is in accordance with the opinion of Gozali & Cahyono (2022) who stated that teachers' readiness and positive attitude are very important in adopting educational technology. However, there are concerns regarding the time needed to prepare technology-based materials. The finding challenges current understanding by showing that despite high acceptance of technology, readiness and time factors remain barriers that need to be overcome.

This research shows the importance of institutional support, professional training and long-term investment in technology to integrate the TPACK model in the Islamic education curriculum. The results also revealed that despite technical challenges and varying readiness among teachers, technology integration in Islamic learning has great potential to improve the quality of education. This opinion is reinforced by research conducted by Chai et al. (2020) which emphasizes the importance of pedagogical technological knowledge in supporting effective learning. Thus, this study not only fills in the gaps of previous specific research but also provides practical guidance to overcome barriers to technology integration in Islamic religious education.

To avoid gaps and problems in the integration of the TPACK model in the Islamic Religious Education curriculum, it is recommended that relevant parties make continuous investments in educational technology, provide adequate professional training and ensure strong institutional support. It is also important to develop adaptive and innovative strategies, such as the use of immersive technologies and collaboration between teachers, to overcome barriers that may arise. If you are already facing these gaps or problems, there is no need to worry because solutions have been found in the results of this study. By following the findings and recommendations, educational institutions can overcome technological challenges and improve teachers' and students' readiness to adopt the TPACK model. This approach will ensure effective technology integration and support religious values in learning.

Conclusion

This study analyzed the readiness to integrate the Technological Pedagogical and Content Knowledge (TPACK) model into the Islamic Religious Education curriculum in five senior high schools in Pekanbaru city. The results revealed significant variations in technology adoption and teacher readiness across the schools. Institutional support and professional training were identified as key factors in overcoming the challenges of technology integration. Additionally, a long-term commitment to educational technology investment, including the use of immersive technologies such as Augmented Reality (AR) and Virtual Reality (VR), demonstrated significant success in some schools. These findings highlight the importance of adaptive and innovative approaches in addressing technological and resource barriers in education.

Theoretically, the findings of this study enrich the literature on the integration of the TPACK model in the Islamic Religious Education curriculum by providing empirical evidence on the importance of institutional support

and professional training. This aligns with previous theories emphasizing the role of technological pedagogical knowledge in supporting effective learning. Practically, these findings offer guidance for educational institutions seeking to enhance teacher and student readiness for technology adoption. By following the recommendations of this study, educational institutions can effectively overcome technological challenges and improve the quality of education. Although this study has limitations, such as the limited sample size of five schools, the results still provide valuable insights that can serve as a foundation for future research. Future studies are recommended to expand the sample size and explore the use of new educational technologies to further enrich student learning experiences.

Furthermore, this research acknowledges that while technology integration shows great potential for enhancing educational quality, significant challenges related to technological readiness and the digital divide among students remain. Therefore, continuous investment in educational technology, adequate professional training, and strong institutional support are crucial. These findings provide practical solutions and advance understanding in the field of Islamic Religious Education, offering directions for future research to further support technology integration in education.

Conflict of Interest

The author declares that there is no conflict of interest.

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Review Article

Analysis of errors in reading English academic texts: A new approach for university students

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Abstract

This study delves into the analysis of errors and difficulties encountered by students in reading academic English texts, a critical aspect of higher education that directly impacts academic success. Utilizing a qualitative research methodology, the research primarily focuses on identifying the nature and types of reading challenges faced by non-native English-speaking students at the university level. Data were collected through in-depth interviews and analysis of reading responses from a diverse cohort of 50 university students in TBI class. The findings revealed a predominant occurrence of lexical and syntactic misunderstandings, leading to misinterpretation of academic texts. Furthermore, the study highlights issues related to the complexity of academic jargon and structural intricacies of English academic writing, which pose significant hurdles in comprehension. The research also uncovers a correlation between the students' reading habits and their comprehension levels, suggesting that infrequent engagement with English texts outside the academic curriculum contributes to these difficulties. This study not only catalogues specific error types but also explores the underlying factors contributing to these challenges, such as the educational background of students and their previous exposure to English. The implications of this research are substantial for curriculum designers and educators, emphasizing the need for tailored reading strategies and interventions to enhance comprehension skills in academic English. These strategies may include focused vocabulary enhancement programs, syntax simplification techniques, and context-based learning approaches. Overall, this study provides a comprehensive insight into the obstacles faced by non-native English speakers in academic reading, laying the groundwork for effective pedagogical reforms.

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Introduction

In today's global context, mastery of English, especially in reading academic texts, is an essential skill for students (Alyousef, 2021; Nushi et al., 2022; Tabatabaee-Yazdi, 2020). This is because English acts as a language of instruction in various fields of knowledge (Coleman et al., 2023; Shchemeleva, 2019). Therefore, research on the errors faced by students in reading English academic texts is very important. Such errors often include difficulties in understanding discipline-specific technical terms, as well as challenges in interpreting complex arguments or assumptions that are not explicit in the text. Other specific examples include errors in identifying main ideas and relating them to the broader context, which are often essential for deep academic understanding. This study is not only relevant for improving the effectiveness of teaching and learning processes, but also for understanding the barriers faced by students in absorbing global knowledge.

Identifying and analyzing the errors faced by university students in reading English academic texts is a highly relevant issue, given that English is often used as a medium of instruction and the main reference source in various disciplines (Bowers et al., 2015; Friberg & Sterri, 2021). Difficulties in understanding English academic texts can hinder learning and knowledge absorption, especially for students who do not have English as a first language (Bikowski, 2018; Choemue & Bram, 2021; Polizzi, 2020). This can have an impact on the quality of education and learning outcomes. Therefore, identifying and understanding these errors is an important first step to designing more effective learning strategies. The research question we will examine is: "What are the common types of errors faced by university students in reading English academic texts, and how do they affect their learning process?" By answering this question, this study aims to provide a clearer picture of the direction and purpose of the research, which is to identify specific barriers in the English academic learning process and formulate learning strategies that can overcome these difficulties.

Errors in reading academic texts can include difficulties in understanding the sentence structure, vocabulary, and cultural context contained in the text (Brysbaert, 2019; Dunn & Kennedy, 2019; Zhang & Zhang, 2021). The impact of these problems is not only limited to academic performance, but also to students' ability to actively participate in academic discussions and research (Harwood, 2018). Therefore, this study makes a significant contribution to the development of more innovative and inclusive English teaching methods, which focus not only on language acquisition but also on analytical and critical skills of academic texts. To address these difficulties, this research will use both qualitative and quantitative approaches, starting with a survey to identify the most common types of errors experienced by university students. Next, an in-depth analysis will be conducted through case studies and interviews with students and lecturers, to understand the root of the problem and its impact on the learning process. The results of this research are expected to provide important insights in facing the challenges of globalization in education and preparing students to be more competent participants in the international academic community.

The importance of reading academic texts effectively for students cannot be ignored in the current context of higher education. Amidst the rapid development of science and technology, academic texts have become the main source of knowledge that students must access and understand (Van Slageren & Van Tubergen, 2021). This article aims to not only identify and analyze common errors made by university students in understanding academic texts but also to differentiate this research from previous studies with the exploration of innovative new learning techniques. One of the innovations we will explore is the use of augmented reality (AR) technology in helping students understand the cultural context in academic texts, an approach that has not been widely researched before. By understanding these types of errors, efforts can be made to develop more effective learning strategies. This will help students not only in improving their reading skills, but also in understanding and applying the knowledge gained from academic texts into academic and professional practice. In a world that increasingly relies on knowledge and information, the ability to read and comprehend academic texts effectively is becoming an essential skill that every university student must master. This research seeks to offer a new perspective in the literature by highlighting the potential of under-explored learning techniques, promising significant advances in the way university students understand and interact with academic texts.

The specific problem addressed by this research is the difficulty faced by university students in understanding English academic texts. These difficulties include various aspects, such as understanding concepts, specific terminology, and the ability to critique and analyze information in depth. This challenge is all the more relevant given English's role as a global language of instruction in academia and research (Pommiez et al., 2021; Fletcher et al., 2004;

Schoor et al., 2022). Many students who struggle with language barriers face difficulties in understanding the content of academic texts, which in turn impacts their academic performance. Previous studies have proposed several solutions, such as intensive language enrichment programs and project-based learning approaches to improve comprehension of academic texts. However, this study is different as we explore the use of adaptive learning technologies and blended learning methods designed to personalize the learning experience and address the specific difficulties faced by each student. This study is important because it not only identifies specific points of difficulty but also provides insights into how to improve the learning process by utilizing the latest technology and innovative pedagogical strategies.

The impact of this problem in the context of English education is significant. Students who cannot understand academic texts well will face difficulties in absorbing knowledge and applying it in research or academic tasks. This not only affects their academic performance, but also their ability to communicate and collaborate in a globalized environment. By improving their ability to read academic texts, students will be better prepared to face challenges in the ever-changing world of work and academia. Therefore, this research not only contributes to the field of English education, but also to the development of academic and professional skills. The results of this research are expected to specifically contribute to the practice of English language teaching through the development of teaching materials and methods that are more responsive to students' specific needs. This includes the use of educational technology to adjust text difficulty levels and provide meaningful feedback, as well as learning strategies that integrate critical and analytical thinking skills. In the context of professional development, this research aims to equip students with more efficient and effective reading skills, thus enhancing their readiness to work in multilingual and interdisciplinary professional environments, expanding their collaboration capabilities, and improving their academic and professional communication skills.

Literature Review

Reading

Reading is defined as a thinking process that can be performed both consciously and unconsciously (Benitez-Correa et al., 2022). Readers can apply different strategies to construct the meaning that the writer wishes to convey. Nunan (2006) explained that reading involves associating information from a book with prior knowledge to gain understanding. He believed that identifying the topic of reading would help readers develop a positive attitude towards reading, making it simpler to combine textual information with their past knowledge. Furthermore, reading is seen as a habit that leads people to success in academic endeavours and in life. Reading instruction is considered an essential component in any second and foreign language curriculum.

English Academic Text

Academic texts in English refer to written materials that are typically used in academic settings, such as journal articles, research works, and scientific publications. These texts often contain complex features including academic discourse, specific text structures, and vocabulary that may pose challenges for ESL (English as a Second Language) students when reading and understanding their content (Sulaiman et al., 2020). On the other hand, Dardjito et al. (2023) present key theories and concepts related to English academic texts, which include: Complexity of Academic Texts: Academic texts use abstract and technical language, which is challenging for non-English majors, especially for those for whom English is not their first language. An in-depth understanding of the structure and conventions of this genre is important to unpack such complexity and facilitate access to the knowledge conveyed.

Research suggests that learning approaches that focus on structural analysis of texts can help students identify and understand key features of academic texts. Reading Strategies and Metacognitive Skills: Introducing reading scaffolding and metacognitive skills can reduce students' reading anxiety and improve comprehension. Scaffolding, or gradual support, helps students build their understanding of the text gradually, by starting from the simple to the more complex. Studies have found that training in metacognitive strategies, such as formulating questions before reading and summarizing after reading, significantly improved students' ability to comprehend academic texts. Reading Scaffolding suggested a sequence to help university students engage meaningfully with academic texts by introducing texts in their everyday language and supporting them in summarizing the meaning in English. This approach, which also emphasizes the importance of gradual transitions from general to more specific understandings, supports active and critical learning of texts. Additional research shows that the integration of educational technology, such as

text annotation software, can strengthen this scaffolding process by providing immediate feedback and facilitating group discussions. Through the implementation of approaches tailored to the specific needs of ESL students, we can improve their access to academic knowledge and support their success in the academic environment. The development of academic reading skills not only enriches vocabulary and text comprehension but also hones critical and analytical thinking skills, essential components of academic and professional success.

Errors in Learning

The theory of errors in learning, particularly in the context of machine learning and statistical learning theory, is a fundamental concept that deals with understanding and quantifying the accuracy of predictive models (McKinley & Rose, 2018; Zhou, 2013). Then, understanding and managing errors in learning is essential for building robust and reliable machine learning models that can effectively generalize unseen data and make accurate predictions (Vittorini et al., 2021). The theory of error learning is that errors in the learning process can provide valuable information that can assist individuals in improving their performance in the future. By understanding the mistakes made, individuals can identify areas where they need to improve their understanding or skills. As such, errors are considered an important part of the learning process as they can trigger reflection, deeper understanding, and improved performance in the future (O'Brien & Carmean, 1967). Therefore, it can be stated that the idea of error in learning is critical in machine learning and statistical learning theory, as it focuses on understanding and evaluating predictive model accuracy. It emphasizes the necessity of error management in developing dependable models and improving future performance. Errors can prompt introspection, greater comprehension, and improved skills, making them an important component of the learning process.

Methodology

Study Design

The research methodology chosen in this article is qualitative with analytical descriptive method. This approach was chosen because it allows the research to investigate in depth the errors faced by university students in reading English academic texts. Through a qualitative approach, it is possible to gain a broader and deeper understanding of the phenomenon under study, especially in complex social contexts and educational environments.

Data Collection

Data sources for this study include journal reviews, documentation, and literature related to the research topic. Document analysis will be conducted to obtain relevant secondary data, including previous studies that have shed light on errors encountered in reading English academic texts. Journal review will involve examining published scholarly articles related to the research topic. The literature used includes textbooks, journal articles, and other relevant sources to provide theoretical and contextual insights into the issues being researched.

The location of this research was chosen at STAIN Mandailing Natal because this institution has unique and relevant characteristics for the research topic. STAIN Mandailing Natal is a higher education institution that represents the context of English language learning in the academic environment in Indonesia, especially in the context of second language learning. Students at this institution come from various linguistic and educational backgrounds, thus providing valuable insights into the difficulties and challenges they face in reading English academic texts. The selection of this location is expected to make an important contribution in understanding the phenomenon under study in a more specific context and directly related to the English language learning experience in Indonesia.

Sources of the Research

In getting valid and real data, this research used the primary sources for this study, namely, university students, specifically from STAIN Mandailing Natal, chosen for its unique characteristics and relevance to the research topic. These students served as the main source of information through their participation in comprehension tests, in-depth interviews, and the analysis of their responses regarding reading academic English texts. The data collected from these students were analysed to identify the errors and difficulties they encountered, as well as the strategies they employed to overcome these challenges.

In addition to the students, the research also gathered secondary data from literature reviews involving scientific journals, academic documentation, and other library sources relevant to the topic of academic English learning. These sources were utilized to construct the theoretical

framework of the study and to compare the research findings with previous studies. Together, these primary and secondary sources provided the basis for the analysis and interpretation of the research findings.

Instruments of the Research

The research instruments that will be utilized for this study include:

1. Reading Comprehension Tests: These are designed to assess the students' understanding of academic English texts. The tests will include various types of questions, such as multiple-choice, true/false, and short-answer questions, to evaluate different aspects of comprehension, including the ability to grasp main ideas, details, inferences, and the vocabulary within the texts.

2. In-depth Interviews: Semi-structured interviews will be conducted with a selection of students to gain deeper insights into their experiences, challenges, and strategies related to reading academic English texts. The interviews will explore their perceptions of the difficulties they face, the strategies they find most effective, and their overall experience with academic English reading.

3. Document Analysis: This involves the review of existing literature, academic journals, and educational materials related to academic English reading. The analysis will help in understanding the current state of research on the subject, identifying gaps in the literature, and situating the current study within the broader academic context.

4. Surveys: To complement the qualitative data from interviews and tests, surveys may also be employed to gather quantitative data on students' reading habits, their self-assessed proficiency in academic English, and their perceived challenges and needs. Surveys will allow for the collection of data from a broader sample of students, providing a more comprehensive view of the student population's reading competencies and difficulties.

Data Analysis

Data analysis will be conducted inductively, where the collected data will be analysed to identify patterns, themes and categories. In this analysis process, the data will be interpreted to understand the meaning and implications of the research findings. This analytical process enables the research to develop a deeper understanding of the phenomenon under study, as well as to draw conclusions that can assist in formulating practical recommendations for English language teaching and learning. This approach to data analysis is in keeping with the qualitative nature of the research, where the aim is to gain an in-depth and contextualised understanding of the issues under study.

The purpose of the analyses in this study was to gain an in-depth insight into the errors encountered by university students in reading English academic texts. The results of these analyses provide answers to the research questions about the types of errors that university students face most frequently, as well as the factors that contribute to these difficulties. By understanding these errors in more detail, this study makes an important contribution to designing more effective learning strategies in English education in academic settings.

Results

The results show that the most frequent errors made by students are grammatical errors, difficulties in understanding technical vocabularies, and capturing nuances and contexts in academic texts. In particular, grammatical errors often relate to complex sentence structures and the use of tense. For example, many students mistakenly use the past tense when they should be using the perfect present tense, which indicates past events whose effects are still continuing today. In addition, students also often have difficulty in understanding vocabularies that are not common or technical in nature, these vocabularies are often essential for understanding key concepts in the text. For example, the term "photosynthesis" is often misunderstood as a simple process of food formation in plants, when in fact the process involves a series of complex chemical reactions. When it comes to nuance and context, many students have difficulty in interpreting implicit meanings or inferring information that is not explicitly presented in the text. This difficulty can be seen in how they often misinterpret the use of irony or metaphor in a text, for example taking ironic statements as literal statements. These errors together indicate an area that requires special attention in the teaching of reading academic texts.

Furthermore, the results of this study also revealed that the factors influencing these difficulties included previous educational backgrounds that did not provide sufficient preparation in academic text reading skills, as well as a lack of exposure to English in everyday environments. A study conducted found that students who came from schools with limited English curriculum

tended to experience greater difficulties in comprehending academic texts compared to those who received more intensive English education. In addition, the lack of daily interaction with English makes students less familiar with the use of the language in real contexts, as found in a study which showed a relationship between the level of daily exposure to English and the ability to read academic texts. The study also found that most students relied on less effective strategies in reading academic texts, such as translating texts into their native language or memorizing vocabularies without understanding the context in which they are used. An analysis supports these findings, suggesting that translation strategies often interfere with the process of forming conceptual understanding due to structural differences between languages, while memorization of vocabularies without context does not help in establishing semantic connections necessary for deep understanding. These results signal the need for a more holistic and integrated teaching approach, which not only teaches linguistic aspects but also effective reading strategies for academic texts.

The first major finding in this study relates to the grammatical errors frequently made by university students. Data analysis showed that the most frequent errors were in the use of tense, subject-verb matching, and the use of prepositions. For example, many university students tend to use the wrong tense in certain contexts or have difficulties in matching subjects with verbs correctly. For example, in the sentence "He studies English every day," students should use "studies" instead of "study" to match the singular subject "He." This error changes the correct grammatical structure and can confuse the reader about the time and habit of the action.

Errors in the use of prepositions are also common, often resulting in sentences that are difficult to understand or have a different meaning than intended. An example of a prepositional error is the use of "in" rather than "on" in the sentence "She insists in going to the park," which should be "She insists on going to the park." This kind of error not only makes the sentence ungrammatical, but can also lead to a wrong interpretation of the subject's intention or action in the text.

These errors can result in misunderstanding concepts or arguments in academic texts, which is detrimental to overall comprehension. These errors are especially noticeable in reading comprehension tests, where students are asked to explain the content of the text or write a summary. Tense errors can alter the timing of the action being talked about, subject-verb errors can cause confusion about who or what is performing the action, and preposition errors can alter the understanding of spatial or logical relationships in the text. Therefore, an accurate understanding of these grammatical rules is essential for effective text comprehension.

The second difficulty identified was in understanding technical vocabularies and capturing nuances and contexts in texts. Many students showed limited understanding of less common technical terms, which are an important part of academic texts in some subjects. For example, in computer science texts, the term "algorithm" is often misunderstood as simply a sequence of steps in programming, without recognizing that algorithms have specific properties such as time and space efficiency that are also important. In addition, many students have difficulty understanding implicit meanings or inferring information that is not explicitly mentioned in the text. For example, when a text says, "The tiger population in this region is declining dramatically," students may fail to infer that habitat loss or poaching is the implicit cause without it being directly mentioned.

This difficulty suggests that critical and analytical reading skills need to be emphasized more in English education. To illustrate, in reading tests, when given texts that contain a lot of technical vocabularies or complex contexts, students' scores show a significant drop compared to more general texts. Errors in understanding technical vocabularies can lead to incorrect interpretations of key concepts, while difficulties in grasping nuance and context can hinder the ability to apply the information in a broader context or in problem solving. This confirms the importance of education that not only focuses on expanding vocabulary, but also on developing the ability to analyze and interpret texts in depth.

A unique finding in this study is the observation that most students tend to use less effective strategies such as translating the text into their native language or memorizing vocabularies without context. This suggests that although students may have a high awareness of the difficulties they face, they do not always adopt the most effective strategies to overcome these problems. For example, technical terms in biology such as "mitochondria" are often memorized as "the energy production site of the cell" without a deep understanding of their functions and biochemical processes. This can lead to misunderstandings when texts discuss the role of mitochondria in disease states or cellular metabolism.

This study found that such strategies are often not effective enough in improving comprehension of complex texts. Data from the study showed that students who relied on the strategies of translating or memorizing vocabularies without context scored

on average 15 percent lower in academic text comprehension tests compared to those who used active learning strategies such as explaining concepts in their own words or group discussions.

These findings emphasize the importance of teaching more effective and holistic reading strategies in academic environments, which not only focus on linguistic aspects, but also on the development of analytical and critical skills. Encouraging students to apply critical thinking in text analysis, such as evaluating the validity of arguments or connecting concepts to existing knowledge, can significantly improve comprehension and retention of information. This suggests that the development of these skills is crucial for success in understanding and applying information from complex academic texts.

Discussion

Interpretation of the results of this study shows that there are significant challenges faced by students in understanding English academic texts. Frequent grammatical errors, such as problems in the use of tenses and subject-verb agreement, indicate that basic understanding of English structures still needs to be strengthened. This difficulty is consistent with previous research, which has shown that second-language learners often experience difficulties in keyword comprehension, thereby affecting overall text comprehension. However, this study provides additional insights by identifying grammatical errors as a major inhibiting factor, which has not been fully explored in Elgort et al. (2015)'s study.

In the context of understanding technical vocabulary and capturing nuance and context in texts, the results of this study resonate with the findings. They found that second language learners often have difficulties in developing academic language skills, which are essential for text comprehension. However, this study reveals that in addition to language skills, difficulties in grasping nuance and context are also a major hindrance, suggesting the importance of teaching that focuses more on critical and analytical reading skills.

When comparing the findings of this study with the effect of strategy learning models on learning interaction, it was found that students often used ineffective strategies such as translating texts or memorising vocabulary. his contrasts with findings from earlier studies, which showed that the use of collaborative reading strategies can improve text comprehension. These results suggest that there is a need to adopt more strategic and collaborative learning approaches in the teaching of English in academic settings.

Overall, the results of this study make an important contribution to understanding the difficulties that university students face in reading English academic texts. The results support and extend the findings of previous research by providing specific insights into grammatical errors in understanding technical vocabulary and text nuances. As such, this study enriches the understanding of the challenges second language learners face in academic contexts.

The study also provides answers to the main questions posed in the introduction. By identifying and analysing grammatical errors in understanding technical vocabulary as well as text nuances, this study points out critical areas that need attention in teaching and learning English at university. This suggests that a more comprehensive teaching approach, which not only focuses on linguistic aspects but also involves the development of critical reading and analytical skills, is needed. In conclusion, this study makes a significant contribution to understanding and addressing the difficulties faced by university students in reading English academic texts, thus providing a clear direction for the improvement of English education at the tertiary level.

The results of this study extend the current understanding of the difficulties faced by university students in reading English academic texts. By highlighting grammatical errors in understanding technical vocabulary as well as the nuances of texts, this study underlines the importance of focusing teaching not only on general language acquisition but also on specific aspects that often become obstacles. It challenges traditional approaches to English language teaching that may place less emphasis on developing critical and analytical reading skills. As such, this research offers a new perspective on the importance of integrating these aspects into the curriculum and methods of teaching English.

The research also challenges the notion that a broad and general vocabulary acquisition alone is sufficient to understand academic texts. It was found that while students may have sufficient vocabulary, they often struggle to understand word usage in specific contexts, especially in academic contexts. This indicates the need to place more emphasis on learning vocabulary in the context of its use, rather than just as a list of words to be memorised. This is a significant challenge for English teachers, who may need to change their teaching strategies to emphasise more on the context and application of vocabulary.

However, this study has some limitations that need to be noted. Firstly, this study was conducted in one particular educational location, namely, STAIN Mandailing Natal, which may not fully reflect the situation in other institutions. Therefore, the findings may not be widely generalizable.

Conclusion

The conclusions of this study highlight the main challenges that university students encounter in understanding English academic texts, including grammatical errors, difficulties in understanding technical vocabularies, and obstacles in capturing the nuances and context of texts. More than just identifying problems, this study has successfully pinpointed specific areas that need more attention in English language teaching at the university level, as per the problem statement. The findings provide impetus for the development of more innovative curricula and teaching methodologies, which emphasize solutions to these problems. The research suggests the integration of more contextualized and applied learning techniques, offering a more dynamic and interactive approach in the English curriculum at universities, with the aim of improving students' ability to comprehend academic texts effectively. Although this study revealed important insights into the difficulties faced by university students in reading English academic texts, there are some limitations that should not be overlooked. This study was only conducted in one educational institution using qualitative methods, which tend to favour in-depth understanding over broad generalizability. This limitation emphasizes the importance of conducting similar studies in various educational institutions to produce more representative data. For future research, it is strongly recommended to integrate qualitative and quantitative methods. This combined approach is expected to generate more diverse insights and more comprehensive data, which will contribute to a broader understanding of students' coping strategies in reading English academic texts. In addition, the results are expected to provide valuable information for the development of more effective teaching practices in the future.

Conflict of Interest

The author declares that there is no conflict of interest.

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The effectiveness of problem based learning flipped classroom on students' higher order mathematical thinking skills based on initial ability

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Abstract

High-order mathematical thinking skills are needed for prospective teachers to support them in becoming professional teachers. The aim of this study was to examine the effectiveness of the Problem Based Learning Flipped Classroom (PBLFC) model in improving students' Higher-Order Mathematical Thinking Skills (HOMTS) based on Initial Ability (IA) and to examine the effect of low, medium, high IA groups and the model used on improving HOMTS. This research employed a quasi-experimental quantitative approach, focusing on second-semester students enrolled in the Introduction to Probability course during the 2020/2021 academic year in the Mathematics Education Study Program at Universitas Negeri Semarang. The study utilized a Randomized Control Group Pre-test Post-test Design, with a sample of 71 students randomly assigned, comprising 35 students in the experimental group and 36 students in the control group. Data were obtained using the test method and processed with N-Gain analysis, t test, and one-way ANOVA, and two-way ANOVA. The results of this study showed that there was an improvement in students' HOMTS through the implementation of PBLFC for all IA groups, the improvement in students' HOMTS through the implementation of PBLFC was higher than that of Problem Based Learning (PBL) class, for medium and low IA, the improvement in HOMTS in PBLFC class was higher than that of PBL class, which means that the PBLFC model is effective in improvement of students' HOMTS, especially in medium and low IA. There is an influence of IA group and the model used on the improvement of students' HOMTS. The implications of this research are that PBLFC can be employed as an efficacious strategy for enhancing students' HOMTS, particularly for those with initial abilities that are below average. Furthermore, it can be utilized as an alternative learning approach that facilitates the advancement of future teacher professionalism. The findings of this study also have the potential to be pursued with qualitative research to elucidate the underlying factors that contribute to the lack of significant improvement in HOMTS among high IA.

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Introduction

One of the provisions that students must have in facing the problems and challenges of social life is Higher Order Thinking Skills (HOTS). HOTS is very important in learning in the 21st century (Tyas & Naibaho, 2021). Meanwhile, according to Lu et al. (2021), HOTS are a cornerstone of a strong learning environment in higher education. By developing HOTS, students become more effective learners, capable of boosting their academic performance and overcoming their learning gaps. HOTS are necessary for effective learning. In addition, HOTS can be a tool for students to contribute to the academic world, the economic sector, and their careers (Lu et al., 2021).

The ability to think critically is not something students automatically possess. It is a skill that needs to be nurtured and developed through dedicated training. Students equipped with strong higher-order thinking skills are well-positioned to navigate their studies with success and ease. Hobri et al. (2020) stated that educators must provide tasks to students that involve higher order thinking that requires students to think creatively and critically.

Rozi et al. (2021) argue that one of the common problems in learning is the application of HOTS. The activity of developing HOT is an activity that is difficult for students to carry out, not a few students have difficulty in developing higher-order thinking. This is corroborated by findings from the study conducted by Tanudjaya & Doorman (2020) who reported that students have difficulty in interpreting mathematical problems related to higher order thinking, difficulty in designing strategies in solving these problems, difficulty in applying knowledge to new contexts, which ultimately causes students to be unable to state their answers. This happens especially when the problem requires more than just the application of rules or algorithms.

Likewise, what happens to students majoring in Mathematics at Unnes, especially in the Introduction to Probability course, is that many students still experience difficulties when facing problems that require higher-level thinking. This was seen from the outcomes of student learning during lectures for the subject of Random Variables and Probability Distribution for the 2019/2020 odd semester, where only 33 percent of students could work on problems that require higher order thinking, as well as in the 2020/2021 odd semester lectures, where only 34 percent of students could work on problems that require HOT.

Suhirman et al. (2020), Baidil and Somakim (2020) stated that the characteristics of HOTS include creative thinking and critical thinking. Indicators of critical thinking skills in this study, which used Perkins and Murphy (2006), include (1) clarification, (2) assessment, (3) inference, and (4) strategies. Many researchers refer to Perkins and Murphy's critical thinking skills including Chou et al. (2018) and Darhim et al. (2020). Meanwhile, mathematical creative thinking skills are based on aspects, namely, fluency produces many relevant ideas, flexibility is able to produce a variety of ideas with different approaches, originality provides unusual answers that are different from others, which are rarely given by many people (Sowden et al., 2015).

One of the strategies that can be employed to cultivate students' HOTS is by applying the Problem Based Learning (PBL) model. PBL can enhance HOTS, which includes critical and creative thinking (Suhirman et al., 2020). According to Adelia et al. (2020), PBL entails using problems as the foundation for cooperatively and independent student learning, aimed at nurturing their problem-solving abilities. PBL is a learning model that encourages students to analyze and integrate a problem.

Flipped Classroom (FC) is a form of blended learning (through face-to-face and online interaction) that combines synchronous learning with asynchronous self-directed learning. In flipped classroom learning there are virtual classes that are online and face-to-face classes in schools (Ramadhani et al., 2019). In this study, synchronous learning occurs live in the classroom, whereas asynchronous learning takes place independently outside the classroom. According to Palinussa et al. (2021) implementing FC learning can enhance students' higher-order mathematical thinking skills (HOMTS).

The impact of PBL and FC on learning outcomes has been widely studied by researchers, including Barrios et al. (2022), Algarni and Lortie-Forgues (2023), and Boye and Agyei (2023). Likewise, research related to HOMTS has also been studied by many experts, including Ahmad et al. (2021) and Palinussa et al. (2021), but there has been no research linking the combined impact of PBL and FC on student HOMTS, so researching related to PBL, FC and HOMTS is interesting and very useful.

The stages in FC learning, as outlined by Ramadhani et al. (2019), Palinussa et al. (2021), and Van Alten et al. (2019), entail students solving problems at home independently. In accordance with the findings of Lonergan et al. (2022), and Adelia et al. (2020), the stages in PBL learning do not entail any preparation related to material and problems, as both are provided by lecturers in class. The combination of PBL and FC can

enhance the effectiveness of learning. In FC, students are provided with material and example problems in advance, which prepares them for in-class learning. This approach allows students with PBL to more effectively solve these problems in class. Moreover, FC facilitates comprehension of fundamental concepts, whereas PBL motivates students to apply these concepts in problem-solving, thereby enhancing effective learning and developing HOTS.

Initial ability (IA) also determines student success in lectures. Agoestanto et al. (2024) in their research found that, classically, students were complete in their learning, but after being traced based on IA it turned out that low IA was not complete, while medium and high IA were complete. This indicates that the IA group must also be considered in seeing the success of learning.

The combination of the analysis of the impact of PBL and FC on students' HOMTS represents a novel approach to this research, as previous studies have not explored this particular area. Furthermore, this study incorporates the IA factor as a significant variable influencing learning outcomes, offering a novel perspective on how the integration of PBL and FC can optimally enhance HOMTS, particularly for students with different IA levels. Consequently, this study not only underscores the efficacy of learning methods but also elucidates the necessity for a more individualized approach in designing learning experiences that can meet the diverse needs of all students.

The objectives of this study are (1) to examine the effectiveness of the Problem Based Learning Flipped Classroom (PBLFC) model in improving students' HOMTS based on IA, and (2) to examine the effect of low, medium, high IA groups and the models used, namely, PBLFC and PBL, on improving HOMTS. This research is beneficial for educators and prospective teachers seeking to enhance the effectiveness of HOMTS through PBLFC learning. Additionally, it underscores the significance of educators taking into account students' initial mathematical abilities and contributing to the advancement of mathematics education at the university level.

Methodology

This study employed a quantitative research methodology utilizing a quasi-experimental design. The research utilized a Randomized Control Group Pre-test Post-test Design, with the experimental group employing PBLFC and the control group employing PBL. The research population was 2nd semester students who took the Introduction to Probability course in the 2020/2021 lecture year, majoring in Mathematics, UNNES Indonesia. The sample consisted of 71 students selected through random sampling, with 35 students in the experimental group and 36 students in the control group. Student IA data using GPA. The experimental group employs the PBLFC model for the learning process, whereas the control group utilizes the PBL model, excluding the FC stage. From the PBL phase according to Lonergan et al. (2022) and FC according to Van Alten et al. (2019), in this study, the PBLFC model syntax is as shown in Table 1.

Before being given the treatment, the two classes were tested to be in a balanced state using IA scores through normality tests, homogeneity tests and mean similarity tests. After the two classes were balanced in IA, each class was grouped into three IA, namely, high, medium and low. IA grouping using Lestari and Yudhanegara (2019) is displayed as Table 2.

Table 2 IA grouping

IA Group	IA score limit (x)
Low	$x < \bar{x} - SD$
Medium	$\bar{x} - SD \leq x < \bar{x} + SD$
High	$\bar{x} + SD > x$

Note: x = IA score.
$\bar{x}$ = average of IA score.
SD = standard deviation of IA score.

Table 1 PBLFC Learning Syntax

Step	Phase	Student's Behavior
0	Viewing the material themselves, whether it is a video or something else	Access the video links or teaching materials provided by the lecturers and conduct an independent search for learning resources related to the material studied
1	Orientation of the problem to students	Clarify the problem by describing or defining the problem
2	Organize students to learn	Describe and organize learning tasks related to the problem given by the lecturer.
3	Guide investigations conducted by students both individually and in groups.	Collecting appropriate information to solve problems
4	Develop and present solutions	Devising plans and working on problem solving
5	Analyze and evaluate the problem-solving process	Reflecting and evaluating and giving the reason for the solution process they used

The research instruments include Semester Learning Plan, learning observation sheet, and HOMTS test. The HOMTS test contains four description questions on mathematical expectation material, two questions measuring critical thinking skills and two questions measuring creative thinking skills, with the questions as follows: (1) In a game someone will get Rp. 500,000 if all the numbers or pictures appear and the dice eye is 6, if a coin and a dice are rolled once and he has to pay Rp. 200,000 if something else appears, what is the expectation of victory for that person?; (2) In a game a person is paid Rp. 200,000 if he draws a jack or queen and Rp. 500,000 if he draws a king or ace from a set of 52 bridge cards. How much should he pay to play if the game is fair?; (3) In a game of rolling two dice once a person wins the game if both sixes appear, how much should the player pay for the game to be fair?; (4) In a game one person wins the game if he draws an ace or queen and loses if he draws any other card from a set of 52 bridge cards. Determine the minimum a player must pay for him to have any hope of winning?

Before being used, the Semester Learning Plan instrument and the learning observation sheet were tested for validity and the test instrument was tested for validity and reliability. Validation was conducted by three experts from Universitas Negeri Semarang. Semester Learning Plan validation includes the suitability of the formulation of learning objectives, the suitability of the material, the suitability of the time used, the suitability of the syntax of the learning model, and the clarity of language. The validation of the learning observation sheet includes the clarity of the aspects observed, the suitability of the plan and the implementation of learning and language clarity. Validation of the HOMTS test includes aspects of substance, construction and language. The results validation of instrument are displayed in Table 3.

Assessing the reliability of the test instrument through the utilization of Cronbach's Alpha test obtained .845 > .70 so it is reliable. Thus, the test instrument test is valid and reliable. Criteria for improving HOMTS using Hake's Normalized Gain (1998).

$$\text{Normalized Gain (g)} = \frac{\text{Posttest Score-Pretest Score}}{\text{Maximum Score-Pretest Score}}$$

Normalized gain criteria displayed in Table 4.

The enhancement of HOMTS was assessed by comparing the post-test scores between the experimental and control groups. The disparity in HOMTS improvement was analyzed using independent t-tests, one-way ANOVA, and two-way ANOVA, facilitated by SPSS.

Table 4 Normalized Gain Criteria

Gain Index	Criteria
$g \geq .7$	High
$.3 \leq g < .7$	Moderate
$g < .3$	Low

Note: g = normalized gain.

Results

Description of HOMTS through the Application of PBLFC Model Based on IA

The description of students' HOMTS through the application of PBLFC is presented in Figure 1, Table 5, and Table 6.

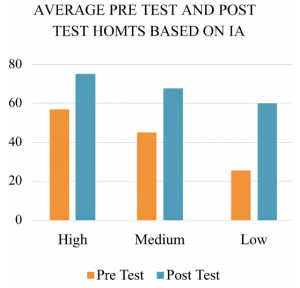

Figure 1 Pre-Test and Post Test of HOMTS of students based on IA in PBLFC

Table 5 Improvement of students' HOMTS based on IA in PBLFC class

IA	HOMTS Improvement
High	18.75
Medium	24.90
Low	36.50

Table 6 Gain score of improving HOMTS in PBLFC

HOMTS on IA	Average Gain	Category
High	.42	Moderate
Medium	.43	Moderate
Low	.48	Moderate

Table 3 Research Instrument Validation Results

Instrument	Expert 1	Expert 2	Expert 3	Average	Category
Semester Learning Plan	3.8	3.8	3.6	3.73	highly valid
Observation Sheet	4	3.67	3.67	3.78	highly valid
HOMTS Sheet	3.75	3.75	3.625	3.71	highly valid

Based on Figure 1 and Table 5, there was an improvement in students' HOMTS from high, medium, and low IA groups, with the highest improvement achieved in the low IA group.

The improvement of students' HOMTS through the implementation of PBLFC based on IA was analyzed using the Gain test according to Hake (1998), the outcomes of which are outlined in Table 6.

According to Table 6, the results of the increase in HOMTS of students given the PBLFC model are in the moderate category, with an average Gain for high IA groups of .42, medium IA .43, and low IA .48. This shows that the low IA group has the biggest increase in HOMTS after the implementation of the PBLFC model.

Improvement of Students' HOMTS through the Implementation of PBLFC Based on IA

To test the improvement of students' HOMTS through the implementation of PBLFC based on MIA, one-way ANOVA test was used, with the SPSS output results displayed in Table 7 (Descriptive output of HOMTS improvements based on IA), Table 8 (Homogeneity test output in the HOMTS improvement test based on IA), and Table 9 (HOMTS improvement test output based on IA with ANOVA).

Based on Anova test, $p = .00 < .05$ is obtained, so there is a significant difference in the average improvement of students' HOMTS for high, medium and low IA in PBLFC class. Based on Table 7, it is obtained that the largest average improvement in HOMTS occurs in low IA.

Differences in the Improvement of Students' HOMTS through the Implementation of PBLFC and PBL

After being given PBLFC learning in the experimental class and PBL in the control class, both classes were given a post test. To test the difference in the improvement of students' HOMTS through the application of PBLFC and PBL, t-test was used, the results of which are in Table 10.

From the output of Levene's Test for Equality of Variances obtained $p = .091 > .05$ then the data on the improvement of HOMTS in PBLFC and PBL classes are homogeneous, From the output of the t-test for Equality of Means obtained $p = .001 < .05$ then there is a difference in the improvement of HOMTS classes given PBLFC and PBL with PBLFC classes better than PBL, namely, the mean improvement of PBLFC = 25.89 > 20.19 = mean PBL, so the PBLFC model is effective in improving HOMTS.

Table 7 Descriptive output of HOMTS improvements based on IA

HOMTS on IA	N	Mean	*SD*
High	7	18.29	5.469
Medium	21	24.81	5.724
Low	7	36.71	2.059

Note: N = number of students.
SD = standard deviation.

Table 8 Homogeneity test output in the HOMTS improvement test based on IA

Levene Statistic	df1	df2	*p*
1.330	2	32	.279

Table 9 HOMTS improvement test output based on IA with ANOVA

Source of variation	Sum of Squares	df	Mean Square	F	*p*
Between Groups	1249.448	2	624.724	23.243	.000
Within Groups	860.095	32	26.878		
Total	2109.543	34			

Table 10 Output of the difference test for the improvement of HOMTS

Class	N	Mean	*SD*	Standard Error Mean
PBLFC	35	25.89	7.877	1.331
PBL	36	20.19	5.810	.968
Independent Samples T Test				
	Levene's Test for Equality of Variances		t-test for Equality of Means	
p	.091		.001	

Note: N = number of students.
SD = standard deviation.

Improvement of Students' HOMTS through the Implementation of PBLFC and PBL Based on IA

In this section, an examination is conducted to determine if there exists a discrepancy in the enhancement of students' HOMTS between PBLFC and PBL classes for each IA utilizing the t-test with assistance from SPSS. The findings are outlined below.

Differences in HOMTS improvement in high IA

Normality test of HOMTS improvement in high IA displayed in Table 11.

Table 11 Normality test of HOMTS improvement in high IA

HOMTS	Kolmogorov-Smirnov Z	*p* (2-tailed)
High	.883	.417

From the One-Sample Kolmogorov-Smirnov Test output in Table 11, it is obtained that the HOMTS data for high IA comes from a normally distributed population.

Mean Difference test of HOMTS Improvement in High IA is displayed in Table 12.

From the Independent Samples Test output in Table 12, $p = .897 > .05$ is obtained, so there is no difference in the improvement of students' HOMTS at high IA for PBLFC and PBL classes.

Difference in HOMTS improvement in medium IA

Normality Test of HOMTS improvement in Medium IA displayed in Table 13.

From the One-Sample Kolmogorov-Smirnov Test output in Table 13, it is obtained that the HOMTS data for medium IA come from a normally distributed population. Table 14 shows Mean Difference Test of HOMTS Improvement in Medium IA.

From the Independent Samples t Test output in Table 14, $p = .004 < .05$ is obtained, so there is a difference in the increase in HOMTS of students in medium IA with the mean improvement in HOMTS of PBLFC class = 24.81 > 19.48 = mean improvement in HOMTS of PBL class. So PBLFC is effective in increasing students' HOMTS for medium IA.

Difference in HOMTS improvement in low IA

Table 15 shows Normality test of HOMTS improvement in low IA.

From the One-Sample Kolmogorov-Smirnov Test output in Table 15, it is obtained that the HOMTS data for low IA come from a normally distributed population.

Table 16 shows Mean Difference test of HOMTS Improvement in Low IA.

Table 12 Mean Difference test of HOMTS Improvement in High IA

HOMTS	Model	N	Mean	*SD*	Standard Error Mean
High	PBLFC	7	18.29	5.469	2.067
	PBL	7	18.00	1.732	.655
Independent Samples T Test					
	Levene's Test for Equality of Variances				t-test for Equality of Means
p	.050				.897

Note: SD = standard deviation.

Table 13 Normality Test of HOMTS improvement in Medium IA

HOMTS	Kolmogorov-Smirnov Z	*p* (2-tailed)
Medium	.918	.368

Table 14 Mean Difference Test of HOMTS Improvement in Medium IA

HOMTS	Model	N	Mean	*SD*	Standard Error Mean
Medium	PBLFC	21	24.81	5.724	1.249
	PBL	21	19.48	5.555	1.212
Independent Samples T Test					
	Levene's Test for Equality of Variances				t-test for Equality of Means
p	.680				.004

Note: SD = standard deviation.

Table 15 Normality test of HOMTS improvement in low IA

HOMTS	Kolmogorov-Smirnov Z	*p* (2-tailed)
Low	1.017	.252

Table 16 Mean Difference test of HOMTS Improvement in Low IA

HOMTS	Model	N	Mean	*SD*	Standard Error Mean
Low	PBLFC	7	36.71	2.059	.778
	PBL	8	24.00	7.426	2.625
		Independent Samples T Test			
		Levene's Test for Equality of Variances			t-test for Equality of Means
p		.003			.001

Note: SD = standard deviation.

From the Independent Samples t-test output in Table 16, $p = .001 < .05$ is obtained, so there is a difference in the improvement in HOMTS of students at low IA with the mean improvement in HOMTS of PBLF class = 36.71 > 24.00 = mean improvement in HOMTS of PBL class. So PBLFC is effective in improvement students' HOMTS for low IA.

Interaction of Applied Model with IA on HOMTS

To test the interaction of the applied model with IA on HOMTS, 2-way ANOVA was used with the help of SPSS, the results are in Table 17.

From Table 17, the p of Class*IA = .01 < .05, so there is an interaction between the IA group and the model used on HOMTS. This means that there is an influence of the IA group and the model used, namely, PBLFC and PBL, on improvement of student HOMTS.

Discussion

The Effectiveness of the Problem Based Learning Flipped Classroom (PBLFC) Model in Improving Students' HOMTS Based on IA

The improvement in HOMTS for all IA groups was in the medium category after being given the PBLFC learning model. In terms of IA, the highest improvement was obtained by low IA with a Gain value of .48 followed by medium IA of .43 and high IA of .42. Thus, the low IA group had the biggest improvement in HOMTS. This is due to the PBLFC model, where students have early access to learning materials through independent learning resources before class meetings. In line with the findings of Yurniwati & Utomo (2020), learning with a combination of PBL and Flipped Classroom models provides opportunities for students to develop HOTS through independent learning activities from videos and reading sources carried out outside the classroom. This provides opportunities for low IA students to learn the material at their own pace and strengthen their basic understanding. When they engage in problem-solving activities in class, they can focus more on applying the concepts they have learned, which in turn improves students' HOMTS. This finding is corroborated by the study conducted by Chang et al. (2022), who revealed that the combination of PBLFC learning helps students in providing an enjoyable experience. Students not only receive knowledge from the teacher, but they also engage in discussion, problem solving, and collaboration with other students. Their learning performance will also improve, and they can think more deeply (Wei et al., 2020).

The ANOVA test revealed a statistically important difference between the groups in the average improvement in students' HOMTS for high, medium and low IA in the PBLFC class. This confirms descriptively that there is a difference in the average improvement in HOMTS between IA groups. Although the biggest improvement in HOMTS is from low IA, judging from the post-test results, low IA is still far below medium and high IA. This is caused by students with low IA usually starting with a more limited understanding of basic mathematical concepts compared to students with medium and high IA. Thus, an alternative is needed that can assist students to collaborate to improve their problem solving skills. By applying the FC model, students with low IA are also supported in developing problem-solving skills and increasing student collaboration in mathematics learning activities (Diana et al., 2023).

In addition, although the biggest increase in HOMTS occurred in the group of students with low IA, the results of the low IA posttest were still far below the medium and high IA. This is because the improvement process takes a longer time compared to students who have medium or high IA. They do not fully have a good understanding if they study independently. They need to adapt because

Table 17 2-way ANOVA results testing the interaction of the applied model with IA

Source	Type III Sum of Squares	df	Mean Square	F	*p*
CLASS*IA	287.046	2	143.523	4.959	.010

they study independently at home, consequently they are not ready for active learning in the classroom (Güler et al., 2023). Therefore, despite the significant improvement, students with low IA may still take longer to reach the same level of proficiency as students with higher IA.

There is a difference in HOMTS improvement in classes that apply PBLFC and PBL models. The class that applied PBLFC experienced a more significant increase in HOMTS than the class that only used PBL, so PBLFC was effective in increasing HOMTS compared to PBL. A study by Oliván-Blázquez et al. (2022) found that combining Flipped Classroom with Problem-Based Learning led to significantly better test scores and pass rates compared to classes using other learning models. This occurs because FC enables students to actively participate in the learning process prior to the class, while PBL allows students to collaborate and think critically when solving problems. Limniou et al. (2018) stated that there is an effect of learning using FC on students' HOTS. Meanwhile, Palinussa et al. (2021), stated that through the implementation of FC, students enhance their HOTS by addressing problems.

The combination of PBL and FC models increases student engagement and motivation to learn. This can be seen in the implementation of the PBLFC model, where students have more opportunities to collaborate and discuss with other students during class time. Collaboration can greatly benefit students' grasp of math. By exchanging ideas, discussing concepts, and even debating approaches, students are exposed to diverse problem-solving strategies. This not only expands their comprehension of mathematics but also nurtures their critical thinking abilities. This is reinforced by Tang's opinion (2023) which states that the integration of FC teaching method with PBL is beneficial for enhancing classroom teaching effectiveness, fostering students' self-learning skills, and boosting their motivation to learn.

The syntax of the PBLFC learning approach is intentionally crafted to enhance HOMTS. During the initial stage, students are prompted to engage with materials through video presentations and instructional resources. This fosters knowledge construction, wherein the development of HOMTS is involved, as it necessitates students to generate their own understanding (Zain et al., 2022). Deep understanding of mathematical concepts will also increase (Egara & Mosimege, 2023). The next phase, which is student orientation to the problem, can develop the ability on the aspect (clarification) to clarify the problem by describing or defining it. In the next stage, students will be directed to be encouraged to actively gather appropriate information. Then, in the phase of developing and presenting solutions, they are asked to plan and apply solutions appropriately. The process encourages critical and creative thinking to determine problem solutions by discussing various new ideas (Cevikbas & Kaiser, 2020). In addition, it encourages the emergence of new ideas and problem solutions according to the elements of creative thinking, namely, flexibility, fluency, and originality. This phase will also encourage the ability in the assessment aspect so that students can make decisions, express arguments, and connect one problem with another. The ability in the aspect (inference) to generalize conclusions and make hypotheses appropriately will also increase. The last phase, analyzing and evaluating problems, will facilitate being able to propose, discuss, or evaluate possible actions or strategies. Every post-activity reflection process facilitates the attainment of critical thinking skills (Evendi et al., 2022). Thus, the PBLFC model is considered superior to the PBL model.

There was no difference in HOMTS at high IA after PBLFC or PBL models were implemented, so PBLFC was not effective in improving HOMTS for students at high IA. In contrast to this, at medium IA, PBLFC is effective in improving HOMTS. Likewise, for low IA, PBLFC is more effective than PBL in improving HOMTS. Thus, overall, PBLFC is more effective than PBL in increasing HOMTS, but seen from IA, the PBLFC model is effective in increasing HOMTS for medium IA and low IA, while high IA has the same HOMTS in PBLFC and PBL. This is because in PBLFC, students are encouraged to understand mathematical concepts through solving real problems. This forces medium and low IA students to think critically, analyze information, and find the right solution, which can increase students' HOMTS. Such is reinforced in the opinion of Lestari (2021), who states that students experience improvements in critical thinking skills, creativity, responsibility, teamwork, and punctuality after being involved in activities in the Flipped Classroom. In addition, when students feel an improvement in their understanding of mathematics and successfully solve more complex problems, it can increase their motivation to engage in further learning. Students with medium IA and low IA who experienced an increase in HOMTS felt more confident and motivated to continue improving their abilities.

The Effect of Low, Medium, High IA Groups and the Models Used, namely, PBLFC and PBL, on Improving HOMTS

Partially, PBLFC was effective in improving HOMTS compared to PBL. Based on the two-way ANOVA test, it was found that there was an effect of the applied model, namely, PBLFC and PBL as well as high, medium and low IA groups on increasing students' HOMTS. According to Thompson (2008) in his research, the distinction between students exhibiting high-level and low-level thinking skills lies in their capacity to comprehend given problems or materials and effectively apply them, both in problem-solving scenarios and in real-life situations. In addition, some students need interesting learning media to help improve their understanding of the material. The PBLFC model provides more time for feedback to students (Al-Zoubi & Suleiman, 2021). The flipped classroom model transforms students from passive learners to active participants. It facilitates the creation of online educational resources and promotes the strategic utilization of technology tools to enhance the learning process at each stage (Salas-Rueda, 2023). Technology allows lecturers to use various assessment formats, including online tests, digital project assignments, online forum discussions, and so on. This allows lecturers to tailor assessment to learning styles and enrich students' evaluation experience. Consequently, this can bolster students' grasp of concepts and foster the development of HOTS.

Conclusion and Recommendation

The conclusions drawn from the conducted research findings are as follows: (1) The PBLFC model is effective in improving students' HOMTS, especially low and medium IA, which is characterized by (a) Students' HOMTS through the implementation of PBLFC improved for all IA (high, medium, and low), with an average Gain for high IA group of 0.42, medium IA of 0.43, and low IA of 0.48, (b) the improvement of students' HOMTS through the implementation of PBLFC is better than the PBL class, (c) the improvement of HOMTS in PBLFC class being higher than that in PBL class occurs in medium and low IA, while the high IA group has no difference in HOMTS improvement; (2) There is an influence of IA group and the model used, namely, PBLFC and PBL, on the improvement of students' HOMTS.

As the research on the implementation of PBLFC was carried out using two classes with a total sample of only 71 students, so that the results are more perfect, it is recommended that similar research can use more samples. The results showed that high IA was not influenced by the increase in HOMTS in PBLFC, so it is necessary to explore in depth with qualitative research what the causes and solutions are. The findings of this qualitative study could potentially lead to a quantitative investigation concerning scaffolding. The results of this study can also be referenced by lecturers in designing lessons in order to improve students' HOMTS.

Conflict of Interest

The authors declare that there is no conflict of interest.

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The development of activity program for enhancing physical fitness and quality of life of the elderly

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Abstract

This study aimed to develop and evaluate the effectiveness of an activity program in enhancing the physical fitness and quality of life for the elderly. The methods included: 1) The program development is based on Pender's Health Enhancing Theory and Protection Motivation Theory. The program's quality is assessed by examining the IOC. 2) The program's effectiveness was assessed by using 60 purposively selected elderly who volunteered and passed the Inclusion criterion. The data were collected three times: before the experiment, after the experiment 4 weeks and 8 weeks, and were analyzed by means, standard deviation, ANOVA with repeated measures, post hoc multiple comparisons Scheffe and t-test at the statistical significance level of 0.05. The research findings were as follows: 1) The development of the activity program consisted of 8 different activities: self-assessment, knowledge of the elderly, recreation for health, aerobic exercise, exercise using elastic, yoga, relaxation, and group counseling. The eight activities had an aggregate IOC of 0.96. 2) The effectiveness of the activity program development found that the average scores of physical fitness and quality of life of the experimental group and control group were significantly different at .05 levels after the 4th week and 8th week. The research findings reveal the effectiveness of the activity program for enhancing physical fitness and quality of life of elderly progressive conditions.

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Introduction

At present, various sources have indicated that Thailand is experiencing a rapid transition into an aging society, with the number and proportion of the elderly population increasing at a rapid rate. (National Statistical Office, 2022)

Thailand's current statistics indicate a growing elderly population. According to the 2021 survey conducted by Foundation of Thai Gerontology Research and Development Institute [TGRI] (2021), there were 13,358,751 elderly people (60 years and over), or 19.6 percent of the total population, divided into 5,974,022 males,

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(44.7%) and 7,384,729 females (55.3%). This represents an increase compared to previous surveys conducted in 1994, 2014, and 2017, which reported proportions of elderly people of 6.8, 14.9, and 16.7 percent of the total population, respectively. The data show a consistent rise in the percentage of elderly people, leading Thailand to transition into the period known as "The Aged Society".

The increasing rate of elderly people has a profound impact on social and family structure, self-care practices, and quality of life. According to the survey conducted by the Ministry of Public Health in 2019, it was found that only 3.3 percent of elderly people reported having excellent physical health, while 12.4 percent evaluated their health as poor (Ministry of Public Health, 2019).

The major problems of elderly people are physical fitness and quality of life, caused by many physical changes that affect the functioning of various organs, such as muscle strength, muscle endurance, flexibility, endurance of the cardiovascular system, and body composition.

According to the 2020 Thai Elderly Health Survey (Department of Health, Ministry of Public Health, 2020), it was revealed that only 37.80 percent of elderly people indicate positive health behaviors, such as daily exercise, abstinence from smoking and alcohol consumption, while 95 percent of the elderly people, or 9.2 million people, suffer from a range of illnesses. The study also revealed that 50 percent of elderly people suffer from overweight or obesity, which exacerbates their difficulty in walking. Therefore, it is necessary to create an appropriate health care and quality of life system, wherein the Ministry of Public Health endeavors to foster healthy behaviors among elderly people that are within the control. This will greatly help to reduce illnesses in order to have a quality population.

There are concepts for developing activity programs to promote physical fitness and quality of life for elderly people. The theoretical concepts that form the basis for developing activity programs are a crucial consideration. From studies, it has been found that the health promotion theory of Pender's theory (Pender, 2006) is appropriate for changing lifestyles to promote one's own health, emphasizing the use of knowledge to design activities or plans for people to change behavior and be able to act accordingly. Pender's Health Promotion Model is one of the most widely used models to change unhealthy behaviors and promote health. Predicting factors and explanatory constructs of health behavior in Pender's model include perceived benefits, barriers, and self-efficacy; behavioral emotions; and interpersonal and situational influencers. The various constructs have been introduced as the strongest predictors of self-care behaviors in recent studies (Hsuan & Pei, 2021). The reason for emphasizing the use of Pender's Health Promotion Model is because this model explores, from a theoretical perspective, the factors and relationships that contribute to participation in health promotion activities to enhanced health and quality of life among older adults. In addition, the theory of motivation to prevent disease (Roger, 1975) is a theory that will encourage elderly people to change their behavior by emphasizing the perception of dangers, the effects of having undesirable health behaviors, and the acceptance of the effectiveness of promoting the avoidance of risky behaviors.

From the situation in Thailand, there are an increasing number of elderly people and physical fitness problems, as well as the lack of promotion of the quality of life of the elderly. As a result, the researcher is interested in applying Pender's theories of health promotion and motivation to prevent disease. Including related research results, they were analyzed and synthesized to develop activity programs to promote physical fitness and the standard of living for elderly people in order to effectively promote self-care behavior related to physical fitness and quality of life among the elderly.

Methodology

Participants

This study is conducted as experimental research, and the detailed methodology employed is described as follows. The activity program was conducted with elderly people aged 60–70 years in the Na Phu Subdistrict Elderly School, Udon Thani Province, Thailand, who were chosen by purposive sampling and were selected based on the following criteria: (1) aged between 60–70 years; (2) male or female; (3) living in Udon Thani Province; and (4) having the potential and the ability to join activities, including sufficient body movement and ability to perform daily routines. The group of elderly people were subjected to physical fitness tests and quality of life tests, and only 60 participants were included in this experiment. Then, the elderly were randomly divided into two groups: the experimental group ($n = 30$) and the control group ($N = 30$). From this stage, no significant differences were observed in the pretest scores for physical fitness or quality between the experimental group and the control group ($p > .05$). Only the experimental group attended the activity program.

Tests

The initial test, which was a specific physical fitness test designed for elderly people, was derived from the Department of Physical Education (2013) and included the following: (1) The 30 Second Chair Stand Test to assess the strength and endurance of the leg muscles; (2) The Sit and Reach Test to measure the flexibility of the lower back and back of the thighs; (3) The 2 Minute Step Up and Down Test to assess the endurance of the heart and circulatory system; (4) The Agility Course Test to assess agility and ability to balance while moving; (5) The Skinfold measurement is a measurement of body fat percentage with the thickness of the fat layer combined with the skin. The test demonstrated strong content validity, concurrent validity, and reliability, developed based on related research and literature, and the IOC was rated by 5 experts as 1.00. Quality of life tests by the World Health Organization (WHOQOL-BREF-THAI) (Ministry of Public Health Department of Mental Health, 2002) demonstrated high validity and reliability with the IOC evaluated by 5 experts as 0.96.

Ethics

The development of an activity program, informed by Pender's Health Enhancing Theory and Protection Motivation Theory, received an approval from the Ethics Committee of Chulalongkorn University. The written consent forms were gathered from all participants.

Activity Program Based on Pender's Health Enhancing Theory and Protection Motivation Theory

The development of an activity program, informed by Pender's Health Enhancing Theory and Protection Motivation Theory, was divided into five phases. The initial phase involved the theories, frameworks, and studies on physical fitness and quality of life for elderly people to build the activity program The theories and literature which were collected from the initial phase were analyzed into a concept, an activity, and an evaluation in the second phase. Later, the activity program was assessed for the content validity by five experts. The health promotion program entered its experimental phase once the index of congruence met its standard.

Data Analysis

All the data from the tests were collected in 3 phases: pre-experiment, during the experiment, and post-experiment and were analyzed using the Statistical Package for Social Science (SPSS). A comprehensive verification process or double checking was carried out to ensure the accuracy of all data. The results of applying the activity program were evaluated both before and after the interventions. Evaluations of physical fitness and quality of life in the experimental group- before, during, and after participating in the activity program were conducted using one-way ANOVA with repeated measures. Comparisons of physical fitness and quality of life scores between the control group and the experimental group were performed using an independent samples t-test. All the statistics were considered to have a p value $< .05$, indicating statistical significance.

Results

The development of activity program based on Pender's Health Enhancing Theory and Protection Motivation Theory

The activity program is based on Pender's Health Enhancing Theory and Protection Motivation Theory for enhancing the physical fitness and quality of life of the elderly people. The program includes eight activities: 1) self-assessment, 2) knowledge of the elderly, 3) recreation for health, 4) aerobic exercise, 5) exercise using elastic, 6) yoga, 7) relaxation and 8) group counseling. This activity program conforms to the quality control criteria established by the experts, as evaluation by its index of congruence (IOC) of 0.96. The activity program lasted for a period of eight weeks. Table 1 presents the objectives of eight activities.

The Results of Applying the Developed Activity Program Based on Pender's Health Enhancing Theory and Protection Motivation Theory for Enhancing Physical Fitness and Quality of Life of the Elderly

The basic statistics of physical fitness and quality of life of the elderly between the experimental group and control group are shown in Table 2.

To determine whether the variances in mean physical fitness and quality of life scores in the experimental group and the control group were different at the time before the experiment, 4 weeks after the experiment, and 8 weeks after the experiment, the researcher performed a One-Way ANOVA with repeated measures analysis of variance as shown in Table 3.

Table 1 The Objectives of Eight Activities in The Activity Program Based on Pender's Health Enhancing Theory and Protection Motivation Theory

Activity	Objective of activity
1. self-assessment	To allow the elderly to evaluate themselves, analyze the causes of their health, find solutions based on the causes and know how to record information correctly and appropriately.
2. knowledge of elderly	To provide the elderly with correct knowledge and understanding about health care behavior and reduce risky behavior in the elderly, create motivation to take care of themselves and be able to practice self-care.
3. recreation for health	To provide the elderly with knowledge and understanding of the benefits of health promotion using recreational activities for health on the elderly, create motivation to take care of themselves and be able to practice self-care.
4. aerobic exercise	To provide the elderly with knowledge and understanding of the benefits of promoting health using aerobic exercise activities and be able to perform aerobic exercise activities correctly and appropriately on a regular basis.
5. exercise using elastic	To provide the elderly with knowledge and understanding of how to promote health using resistance exercise activities using elastic bands, so that they can perform resistance exercise activities using elastic bands correctly and appropriately on a regular basis.
6. yoga	To provide the elderly with knowledge and understanding of the benefits of health promotion using yoga exercise activities. Elderly people can perform yoga exercise activities correctly and appropriately on a regular basis.
7. relaxation	To provide the elderly with correct knowledge and understanding about relieving emotions and stress, practice skills in relieving emotions and stress, be able to control emotions and reduce anxiety.
8. group counseling	To provide advice and assistance to the elderly regarding health information, health problems, and practice to promote their own health to enhance their efficiency in avoiding health-risk behaviors.

Table 2 The Basic Statistics of Physical Fitness and Quality of Life of the Elderly between the Experimental Group and Control Group

N= 30

Experimental Group	Pre-test		Post-test After 4 weeks		Post-test After 8 weeks	
	M	*SD*	*M*	*SD*	*M*	*SD*
1. Muscle Strength	1.40	0.54	2.63	0.58	3.63	0.95
2. Flexibility	2.63	0.58	4.18	0.84	4.58	0.54
3. Cardiovascular system	1.75	0.54	2.68	0.61	3.63	0.97
4. Agility	2.17	0.95	3.03	0.73	3.70	0.88
5. Quality of Life	76.47	8.91	88.58	8.01	106.3	7.95
Control Group	Pre-test		Post-test After 4 weeks		Post-test After 8 weeks	
	M	SD	M	SD	M	SD
1. Muscle Strength	1.43	0.54	1.53	0.55	1.50	0.55
2. Flexibility	2.58	0.71	2.63	0.62	2.73	0.59
3. Cardiovascular system	1.80	0.60	1.85	0.66	2.03	0.66
4. Agility	2.05	0.93	2.10	0.92	2.23	0.62
5. Quality of Life	79.40	7.31	75.80	8.91	77.88	6.46

Table 3 Results of a One-Way ANOVA with Repeated Measures Analysis of Variance on the Mean Physical Fitness and Quality of Life Scores within the Experimental Group and the Control Group at the Time before the Experiment, 4 Weeks after the Experiment, and 8 Weeks after the Experiment

N= 30

Experimental Group	source of variation	SS	df	MS	F	p
1. Muscle Strength	Between	99.35	2	49.67	109.71	0.00*
	Within	35.31	58	0.45		
	Total	134.66	60	50.12		
2. Flexibility	Between	84.86	2	42.43	125.05	0.00*
	Within	26.46	58	0.33		
	Total	111.32	60	42.76		
3. Cardiovascular system	Between	70.31	2	35.15	119.14	0.00*
	Within	23.01	58	0.29		
	Total	93.32	60	35.44		

Table 3 Continued

N= 30

Experimental Group	source of variation	SS	df	MS	F	p
4. Agility	Between	46.71	2	23.35	68.45	0.00*
	Within	26.61	58	0.34		
	Total	73.32	60	23.69		
5. Quality of Life	Between	180.26	2	901.63	116.54	0.00*
	Within	603.73	58	77.36		
	Total	783.99	60	978.99		
Control Group	source of variation	SS	df	MS	F	p
1. Muscle Strength	Between	0.21	2	0.10	0.49	0.61
	Within	17.11	58	0.21		
	Total	17.32	60	0.31		
2. Flexibility	Between	0.46	2	0.23	0.69	0.50
	Within	26.20	58	0.33		
	Total	26.66	60	0.56		
3. Cardiovascular system	Between	1.11	2	0.55	1.96	0.14
	Within	22.21	58	0.28		
	Total	23.32	60	0.83		
4. Agility	Between	0.65	2	0.32	1.11	0.33
	Within	22.68	58	0.29		
	Total	23.33	60	0.61		
5. Quality of Life	Between	261.21	2	130.60	2.18	0.12
	Within	466.11	58	59.84		
	Total	727.32	60	109.44		

Note: * $p < .05$

In order to know which stages of the experimental groups are different, the researcher tested the differences in pairs using the Scheffe method as shown in Table 4.

A comparison at the time before the experiment, 4 weeks after the experiment, and 8 weeks after the experiment average scores on physical fitness and quality of life between the experimental group and the control group is shown in Table 5.

Table 4 Results of Pairwise Comparisons of the Mean Scores of Physical Fitness and Quality of Life of the Experimental Group Over Time

Variable	Time		Mean	Comparison	*p*
1. Muscle Strength (A)	Pre-test	A_E1	1.40	A_E1- A_E2	0.00*
	After 4 weeks	A_E2	2.63	A_E2- A_E3	0.00*
	After 8 weeks	A_E3	3.63	A_E3- A_E1	0.00*
2. Flexibility (B)	Pre-test	B_E1	2.63	B_E1- B_E2	0.00*
	After 4 weeks	B_E2	4.18	B_E2- B_E3	0.00*
	After 8 weeks	B_E3	4.58	B_E3- B_E1	0.00*
3. Cardiovascular system (C)	Pre-test	C_E1	1.75	C_E1- C_E2	0.00*
	After 4 weeks	C_E2	2.68	C_E2- C_E3	0.00*
	After 8 weeks	C_E3	3.63	C_E3- C_E1	0.00*
4. Agility (D)	Pre-test	D_E1	2.17	D_E1- D_E2	0.00*
	After 4 weeks	D_E2	3.03	D_E2- D_E3	0.00*
	After 8 weeks	D_E3	3.70	D_E3- D_E1	0.00*
5. Quality of Life (E)	Pre-test	E_E1	76.48	E_E1- E_E2	0.00*
	After 4 weeks	E_E2	88.58	E_E2- E_E3	0.00*
	After 8 weeks	E_E3	106.30	E_E3- E_E1	0.00*

Note: * $p < .05$

Table 5 The Comparison of Average Scores on Physical Fitness and Quality of Life between the Experimental Group and the Control Group

N= 30

	Experimental Group		Control Group		t	p
	M	SD	M	SD		
Pre-test						
1. Muscle Strength	1.40	0.54	1.43	0.54	-0.20	0.83
2. Flexibility	2.63	0.58	2.58	0.71	0.34	0.73
3. Cardiovascular system	1.75	0.54	1.80	0.60	-0.38	0.69
4. Agility	2.17	0.95	2.05	0.93	0.59	0.55
5. Quality of Life	76.47	8.91	79.40	7.31	-1.60	0.11
After 4 weeks						
1. Muscle Strength	2.63	0.58	1.53	0.55	8.62	0.00*
2. Flexibility	4.18	0.84	2.63	0.62	9.32	0.00*
3. Cardiovascular system	2.68	0.61	1.55	0.66	5.77	0.00*
4. Agility	3.03	0.73	2.10	0.92	4.94	0.00*
5. Quality of Life	88.58	8.01	75.80	8.91	6.73	0.00*
After 8 weeks						
1. Muscle Strength	3.63	0.95	1.50	0.55	12.19	0.00*
2. Flexibility	4.58	0.54	2.73	0.59	14.39	0.00*
3. Cardiovascular system	3.63	0.97	2.03	0.66	8.57	0.00*
4. Agility	3.70	0.88	2.23	0.62	8.64	0.00*
5. Quality of Life	106.3	7.99	77.88	6.46	17.55	0.00*

Note: * $p < .05$

Discussion

The Development of an Activity Program Based on Pender's Health Enhancing Theory and Protection Motivation Theory

The researcher analyzed and synthesized the concepts of Pender's Health Enhancing Theory (Pender, 2006). It is an appropriate theory for changing lifestyles to promote one's own health, emphasizing the use of knowledge to design activities or plans for people to change their behavior and be able to act according to their choices. Protection Motivation Theory (Roger, 1975) is a theory to encourage elderly people to change their behavior by emphasizing their perception of dangers and consequences of having undesirable health behaviors and their perception of the effectiveness of promoting them to avoid risky behavior. This theory includes various resources and research which can be used to develop activities and enhance the physical fitness and quality of life of elderly people. These activities include the eight activities as follows: 1) self-assessment and 2) knowledge of elderly people. 3) recreation for health; 4) aerobic exercise; 5) exercise using elastic 6) yoga; 7) relaxation; and 8) group counseling. This activity program conforms to the quality control criteria established by the experts, as its index of congruence (IOC) is 0.96. Therefore, the eight activities positively affected the elderly's physical fitness and quality of life. The group of elderly positively changed their knowledge and attitudes and reduced their risky behaviors. Pender's Health Promotion Model has been widely adopted to explore different health promotion behaviors and has achieved concrete results. Previous studies have reported that participating in health promotion activities enhanced their overall mind–body fitness and physical conditions. In addition, social support when participating in health promotion activities not only positively affects the physical and mental health of older adults but also plays an important role in reinforcing their continuous involvement in such activities. In Pender's Health Promotion Model, the concept of perceived self-efficacy is included as part of behavior-specific cognitive and emotional factors. This is supported by multiple studies, which reported that self-efficacy is an important factor that promotes an individual's participation in health promotion behaviors and lifestyle (Hsuan & Pei, 2021). The result is aligned with the study, which was conducted by Su et al. (2014), on the impact of involvement in recreational sports on the physical and mental health and quality of life of elderly people. The findings reveal that the scores of elderly participants physical health, mental health, and quality of life were significantly higher. Furthermore, Vestergrad & Puggard (2006) studied the use of exercise training to maintain the health of men and women aged

65 years and over. The research aimed to study the effects of an exercise program on 1) standard mechanical fitness tests and 2) physical measurements 3) measuring work ability and 4) changes in the use of health services. The sample group received aerobic, strength, balance, and game training exercises. Additionally, there are physical performance tests and physical fitness tests. The results found that there are significant differences in various tests.

Evaluation of the Effectiveness of an Activity Program for Enhancing the Physical Fitness and Quality of Life of Elderly People

Activities that promote physical fitness and improve the quality of life of elderly people include self-assessment and knowledge of the elderly, which are activities that allow the elderly to know how to evaluate themselves and obtain accurate knowledge and understanding about the elderly (Haywood et al., 2005). Elderly people are aware of health care behaviors and reduce risky behaviors that lead to self-harm. They create motivation to take care of themselves and are able to take care of themselves through the process of using images, videos, information sheets, and information on the internet (Health Education Division, Department of Health Service, 2015). Elderly age is when the body gradually deteriorates. Various systems work less or less efficiently, causing health to deteriorate as well. Even though we cannot fix the factors of physical deterioration in elderly people, we can take care of ourselves for good health, which is consistent with Protection Motivation Theory (Roger, 1975). It states that an evaluation of the perceived severity of an impact on health and quality of life will influence a person's response to the threat, which will cause people to avoid health risk behaviors. Pender's Health Enhancing Theory (Pender, 2006), states that making people aware of the benefits of practicing behavior will make them develop or change behavior in a better way. This is consistent with Ghasemtalebi et al. (2015), who studied the promotion of exercise behavior in elderly people and found that after the experiment, the elderly people had an average score of knowledge about exercise, perception of benefits of exercise, perceived barriers to exercise, self-efficacy for exercise, and correct exercise behavior significantly higher than before the experiment. Therefore, it can be concluded that self-assessment and knowledge of elderly people are activities that allow elderly people to know how to evaluate themselves and to obtain accurate knowledge and understanding about elderly people, stimulating the elderly to be alert about health care behaviors and reduce risky behaviors that lead to illness, create motivation to take care of oneself and be able to take care of oneself, exchange opinions, discussions, knowledge, suggestions, and recommendations, and exchange experiences.

Activities that develop the practices include recreation for health, aerobic exercise, exercise using elastic, yoga, and relaxation, which are organized to create beliefs that one has the ability to do new behaviors. Becoming aware of the benefits of exercise brings positive results for yourself. The result is in accordance with the study which was conducted by Predovan et al. (2012). It presented the effect of three months of aerobic training on performance in older adults to promote aerobic exercise. The results showed that after the experiment, there were changes in exercise and performance that were significantly better compared to the pre-experiment. Furthermore, according to Ghasemtalebi et al. (2015), who studied the effect of aerobic exercises on quality of life in elderly women, consisting of providing knowledge, demonstrations, and practice exercises, it was found that elderly women after the experiment had behaviors promoting exercise in terms of knowledge, perceived benefits, self-efficacy, and behavior in exercising that increased significantly from before the experiment, and quality of life improved. It also corresponds to Hariprasad et al. (2013) and Koohboomi et al. (2015), who studied the application of yoga exercise in elderly people and found that after the experiment, the elderly people had knowledge about exercising with yoga. The elderly individuals significantly increased their perception of the benefits of yoga exercise, their ability to exercise and their practices of correct yoga poses compared to pre- the experiment. Furthermore, Su et al. (2014), who studied the effects of involvement in recreational sports on physical and mental health and the quality of life of elderly people, found that after receiving recreational activities, elderly people had better physical and mental health, including a higher quality of life than before participating in the activity. Furthermore, the research revealed that implementing an exercise program enhanced the elderly's confidence in exercising and served as a practical guideline to mitigate the risk of harm during and after exercises.

Counseling activities are those that provide assistance and positive reinforcement, whether material or psychological. Motivation and commitment to take care of one's health, exercising, and discussing the benefits of the activity program are encouraged to develop a sense of self-care by expressing genuine affection and benevolent intentions; giving advice, engaging in discussion and giving opinions, giving suggestions,

and giving encouragement in practical matters. The result is in accordance with the study conducted by Kaur & Venkateashan (2015) that stated that individuals possessed self-awareness and the capacity to evaluate their own competence as well as have the ability to take control over their own behavior by health personnel This interpersonal influence plays a crucial role in promoting health behaviors by providing support in terms of knowledge, resources, information, and emotional assistance, which have a direct influence on health-promoting behavior, leading to intentions to plan for implementing health-promoting behavior.

However, in various activities, the activity operator should prepare media, such as video, that demonstrate the correct principles and methods to increase the interest of the activity participants and create the most efficiency. Study the results of organizing the activity according to the activity program to promote physical fitness and improve the quality of life of the elderly, separated by males and females, so that differences between the genders will be visible. The effectiveness of the activity program to promote physical fitness and improve the quality of life of the elderly should be studied using various forms of activity. After the experiment, it is important to provide promotion and support to arrange the various activities that the elderly can engage in. This will help to enhance their physical fitness and ensure a lasting improvement in their quality of life. Additionally, conducting monthly follow-up studies will contribute to this goal in order to assess the long-term sustainability of practices that promote physical fitness and enhance the quality of life in the elderly.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Integrating character education and peer dynamics to cultivate entrepreneurship in Islamic boarding school students

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Abstract

Character education is a fundamental aspect of the educational system, aiming to develop individuals with strong moral and ethical values. In the context of modern Islamic boarding schools, the integration of character education with peer dynamics and entrepreneurship has been under-researched comprehensively. This study employs a quantitative design with a survey approach to analyze the influence of character education and peer interaction on the entrepreneurial spirit of students. The results indicate that the variables of character education and peer interaction significantly influence the students' independence, with high validity and reliability tests. These findings underscore the importance of a holistic approach in boarding school education to effectively develop students' character and entrepreneurial skills. Theoretically, this study enriches the literature on character education and entrepreneurship, while practically, the results provide concrete guidance for boarding school administrators in designing an integrative curriculum. This study has limitations in terms of sample size and methodology, suggesting further research with a larger sample and diverse methods to deepen understanding.

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Introduction

Character education is a vital aspect of the educational system, aiming to shape individuals with strong moral and ethical values (Amien et al., 2022). Integrating character education into the curriculum focuses on developing students' moral and ethical qualities, in addition to academic achievement. Social interaction among peers plays a crucial role in children's social and emotional development, including within educational environments (Sadiah, 2022). Positive peer relationships can enhance learning motivation and engagement in school activities (Puspitarini et al., 2023), while difficulties in peer relationships can lead

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to challenges in academic achievement and social-emotional development (Amilda et al., 2023). Modern Islamic boarding schools integrate character education and social interaction into their curriculum to create a holistic learning environment (Jubba et al., 2021). This integration aims to develop students who excel in knowledge and possess strong character and social interaction skills. Character education in these schools involves instilling values such as honesty, responsibility, discipline, and cooperation, essential for shaping a good character (Amien et al., 2022).

Modern Islamic boarding schools (pesantren) employ various teaching methods to instill character values, with teachers serving as role models and emphasizing moral and ethical values (Zulfikar et al., 2023). Social interaction among peers is crucial for learning character values, such as cooperation, respect, and conflict resolution (Fatah et al., 2023). This helps develop empathy and communication skills. Entrepreneurship education is also integrated into the curriculum to cultivate an entrepreneurial spirit, focusing on business and management skills (Wibowo et al., 2022). A humanistic entrepreneurial approach is applied, emphasizing spiritual and moral values in business, aligning with Islamic principles (Wibowo et al., 2021). This prepares students to become agents of change, equipped with skills to identify opportunities, manage resources, and innovate for the community's benefit (Anam et al., 2019). Pesantren play a vital role in shaping a young generation prepared to face economic challenges and contribute to national development.

Character education in modern pesantren has become a primary focus in efforts to shape individuals who excel not only academically but also possess strong moral and ethical values. Muhajir (2022) highlights the importance of integrating character education based on Islamic pluralism into the modern pesantren curriculum, emphasizing aspects of religiosity, independence, integrity, mutual cooperation, and nationalism. The main challenge in developing this curriculum is the uneven ability among teachers to integrate character values into the subjects they teach.

Research by Manshur (2020) and Mujahid (2021) highlights the significance of Arabic literary works and Islamic orthodoxy in shaping character education in pesantren. These studies demonstrate that character education in pesantren can promote linguistic and literary sensitivity, tolerance, and inclusive cultural growth. Additionally, Purwanto et al. (2021) found that the character education program at the Islamic University of Indonesia's pesantren was effective in shaping good character and fostering open and tolerant understanding of religion (Islamic et al., 2024). However, Fawait et al. (2020) identified a need for approaches tailored to students' demographic characteristics. Despite extensive research, there is a lack of comprehensive studies integrating character education with peer dynamics and entrepreneurship in pesantren. The current literature overlooks the critical role of peer interaction in shaping students' entrepreneurial mindset. Furthermore, there is a need for quantitative data to support findings and develop evidence-based practices. Educators' competence in delivering integrated character and entrepreneurship education also presents a challenge.The importance of this research is driven by the urgent need to address the gaps in integrating character education, peer dynamics, and entrepreneurship in modern pesantren. This study is significant as it seeks to provide solutions to the challenges faced by pesantren in shaping the character and entrepreneurial spirit of their students. By combining character education and peer dynamics in entrepreneurial development, this research aims to address the root cause of the problem: the lack of a holistic approach in the pesantren curriculum that can create independent, innovative, and ethical generations.

Therefore, this research aims to explore how the integration of character education and peer dynamics can be used to foster an entrepreneurial spirit among students in modern pesantren. The study will examine effective teaching methods, the role of educators, and social interactions among students to identify key factors that support character and entrepreneurial development. The results of this study are expected to provide practical guidance for pesantren in implementing comprehensive and effective educational programs.

Methodology

Research Design

This study employs a quantitative design with a survey approach to analyze the influence of character education and peer interaction on the development of the entrepreneurial spirit in modern Islamic boarding schools (Johnson & Christensen, 2014). Conducted in modern Islamic boarding schools (pesantren) in Indonesia, the study focused on institutions with structured character education programs and social interaction activities. Data collection occurred from January to March 2024, encompassing recruitment, exposure, follow-up, and data collection periods.

Sampling

The study's population consists of students enrolled in modern pesantren with established character education programs, who have been part of these programs for at least one year. A total of 300 students were selected using random sampling techniques to ensure representativeness of the population (Fauzi et al., 2022). The primary variables measured are character education, peer interaction, and student independence, serving as indicators of the entrepreneurial spirit. These outcomes, exposures, predictors, potential confounders, and effect modifiers were clearly defined and measured.

Data Collection

Data were collected using a questionnaire validated and tested for reliability. The questionnaire included items related to character education and peer interaction. Instrument validity was tested using T-test values, while reliability was assessed using Cronbach's Alpha. To ensure the comparability of assessment methods, all participants were evaluated using the same standardized instrument. Efforts to address potential sources of bias included the use of random sampling techniques and standardized data collection procedures, minimizing response bias by ensuring participant anonymity and confidentiality.

Character Education

What importance do you place on honesty in your daily life? (Scale: 1–5)

How often do you participate in religious activities in the pesantren? (Scale: 1–5)

How do you rate your self-discipline in completing tasks? (Scale: 1–5)

Peer Interaction

How often do you work in groups with your peers on assignments? (Scale: 1–5)

How comfortable are you sharing your ideas with your peers? (Scale: 1–5)

How do you rate your ability to resolve conflicts with peers? (Scale: 1–5)

Student Independence

How often do you make decisions without consulting others? (Scale: 1–5)

How confident are you in taking care of yourself? (Scale: 1–5)

How do you rate your ability to set goals and achieve them? (Scale: 1–5)

These questions were designed to measure the variables of interest and were tested for validity and reliability.

Study Size

The study size of 300 students was determined based on statistical power analysis, ensuring adequate power to detect significant effects of the variables under investigation.

Quantitative variables

Quantitative variables were handled using descriptive and inferential statistical methods. Character education and peer interaction were treated as continuous variables, and their relationships with the entrepreneurial spirit were examined through regression analysis.

Data Analysis

The data were analyzed using descriptive and inferential statistical methods. Regression analysis examined the relationships between character education, peer interaction, and the entrepreneurial spirit.

Statistical Analysis

The statistical analysis began with descriptive statistics to summarize the demographic characteristics of the participants and the variables of interest. Inferential statistics were then used to examine the relationships between character education, peer interaction, and student independence. Regression analysis revealed a significant positive relationship between character education and student independence, as well as between peer interaction and student independence. Correlation analysis showed a strong positive correlation between character education and peer interaction, and between both variables and student independence. Multicollinearity tests ensured that the independent variables were not highly correlated, while heteroscedasticity tests confirmed constant variance of the residuals. Normality tests confirmed that the residuals were normally distributed. Overall, the statistical analysis supported the research hypotheses, indicating that character education and peer interaction are significant predictors of student independence.

Results and Discussion

Validity and reliability tests were conducted as initial steps to ensure the accuracy and dependability of the research instruments. The validity test results showed that all statement items on the character education variable (X1) had T-test values greater than the T-table value (1.652), indicating that all items were valid. Additionally, the reliability test results using Cronbach's Alpha showed a value of 0.876, within the range of 0.81–1.00, indicating that the data were highly reliable. Similarly, the peer interaction variable (X2) showed positive validity test results with T-test values greater than the T-table value for all statement items, and a Cronbach's Alpha value of 0.783, indicating that the data were reliable.

Data analysis included multicollinearity tests, heteroscedasticity tests, normality tests, and regression tests. The multicollinearity test showed no high correlation among the independent variables, with VIF values below 10 and tolerance values above 0.10. The heteroscedasticity test based on the residual scatterplot indicated no specific pattern, suggesting the absence of heteroscedasticity. The normality test using histogram and Normal P-P Plot showed a normal distribution of data. The regression test results indicated that the variables of character education (X1), peer interaction (X2), and student independence (X3) had a significant influence on student independence (Y), with each variable having a significance value less than 0.05. The resulting regression Equation (1) was:

$$Y = 30.0753 + 0.298X1 + 0.319X2 + 0.576X3 - 0.044X4 \quad (1)$$

Unadjusted estimates showed significant effects of X1, X2, and X3 on Y. Adjusted estimates, controlling for potential confounders, also showed significant effects with 95 percent confidence intervals. For example, the 95 percent confidence interval for the effect of X1 on Y was [0.210, 0.386], indicating precision in the estimate. Confounders included in the adjustment were age, gender, and socioeconomic status, as they were relevant to the educational context and student independence.

Subgroup analyses were performed to examine interactions between different levels of character education and peer interaction. Sensitivity analyses confirmed the robustness of the findings, showing consistent results across various assumptions and analytical methods. Figure 1 shows that character education and social peer interactions play a crucial role in fostering the entrepreneurial spirit among students in modern pesantren. Structured character education and positive social interactions among peers can enhance students' ability to be independent and entrepreneurial. The results of this study provide significant contributions to the development of curriculum and teaching methods in modern pesantren and encourage the implementation of more effective character education in supporting student independence. The implementation of these findings is expected to create a more conducive educational environment for fostering the entrepreneurial spirit among pesantren students.

Below is the data display for the research findings mentioned above (Figure 1).

Figure 2 shows that the heatmap of validity for the character education variable (X1) illustrates that all statement items exhibit Rxy values significantly above the threshold, confirming their validity. The T-count values, consistently surpassing the T-table value of 1.652, further substantiate this finding. This visual representation as shown in Figure 2, underscores the robustness of the character education measurement, ensuring that each item accurately reflects the underlying construct. Such rigorous validation aligns with the research focus on nurturing character education, as it ensures the reliability and precision of data used to evaluate the development of entrepreneurial spirit in modern Islamic boarding schools. This robust measurement is crucial for deriving meaningful insights and actionable recommendations from the study.

Figure 1 Heatmap of validity for character education variable (X1)
Source: Data processed, 2024

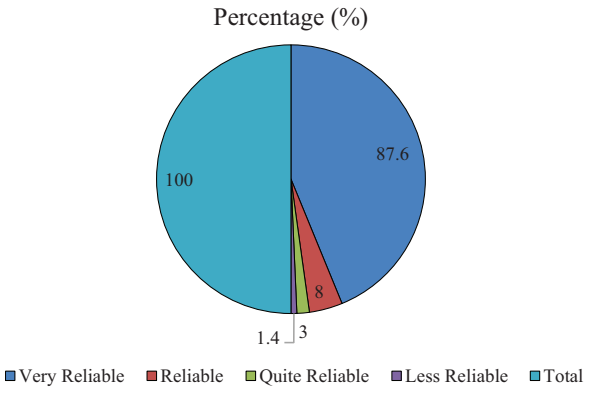

Figure 2 Reliability of character education variable (X1)
Source: Data processed (2024)

The pie chart showing the reliability of the character education variable (X1) indicates that the Cronbach's Alpha value is 0.876, which is in the "highly reliable" category. This indicates that the instrument used to measure character education has a very high internal consistency. This high reliability is important in the context of research that focuses on the formation of entrepreneurial spirit in modern pesantren, as it ensures that the data collected from respondents are consistent and reliable. Thus, the findings generated from this measurement can provide an accurate picture of the effectiveness of character education in supporting the development of entrepreneurial spirit among santri. (Figure 3)

The residual box plot diagram for the linearity test shows that the residuals are symmetrically distributed around the zero line, which indicates the absence of heteroscedasticity problems in the regression model.

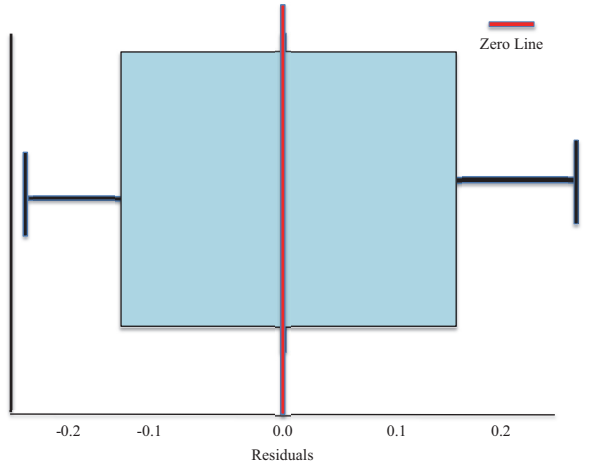

Figure 3 Box plot of residuals for linearity test
Source: Data processed (2024)

This means that the character education and peer interaction variables have a consistent linear relationship with the santri independence variable. In the context of this study, this result is important because it ensures that the regression analysis used to assess the effect of character education and peer interaction on the formation of entrepreneurial spirit in modern pesantren is valid. Thus, the regression model used can be trusted to produce accurate and reliable findings. (Figure 4)

The Normal P-P Plot of Residuals shows that the residual points are close to the diagonal line, which indicates that the residual data are normally distributed. This shows that the normality assumption in the regression test is met, so the regression model used in this study can be considered valid. In the context of this study, the validity of data normality is crucial to ensure that the results of statistical analysis, such as the F test and t test, are reliable and valid for testing hypotheses regarding the effect of character education and peer interaction on santri independence. Thus, the data used in this study are eligible to conduct more complex further analysis, supporting the overall validity of the research findings (Figure 5).

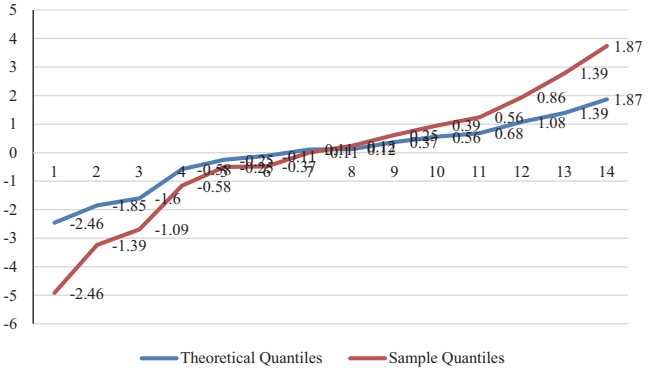

Figure 4 Normal P-P plot of residuals
Source: Data processed (2024)

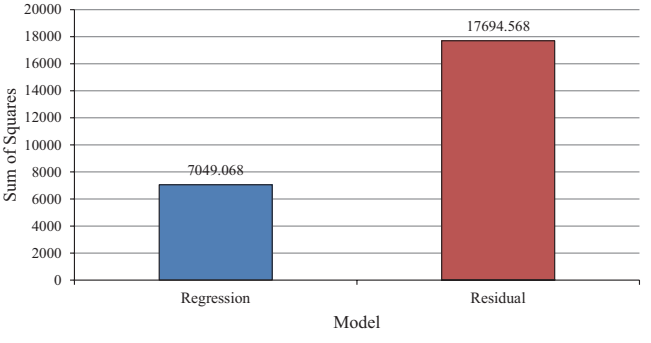

Figure 5 ANOVA results
Source: Data processed (2024)

The ANOVA results displayed on the bar chart show that the independent variables, namely, parenting, character education, and peer interaction, significantly affect the dependent variable, namely, santri independence. With a high sum of squares value in the regression model (7049.068) compared to the residual (17694.568), as well as a significant F value (20.616, p value < .05), it can be concluded that the regression model used is appropriate and the independent variables together have a significant influence on santri independence. This is relevant to research on how character education and social interaction in modern pesantren contribute to the development of the entrepreneurial spirit, showing that these factors have a statistically significant impact on the independence of santri.

The bar chart showing the coefficient of the regression model reveals that the variables of parenting (X1), character education (X2), and peer interaction (X3) have a positive and significant influence on santri independence (Y). The coefficient for parenting is 0.298, character education is 0.319, and peer interaction is 0.576, indicating that peer interaction has the most impact. In contrast, the life skills variable (X4) has a negative coefficient (-0.044) and is not significant. This result is relevant to the research topic on the formation of entrepreneurial spirit in modern pesantren, as it emphasizes the importance of character education and social interaction in increasing the independence of santri. This suggests that a holistic approach that includes aspects of character education and social support from peers greatly contributes to the development of the entrepreneurial spirit in the pesantren environment. (Figure 6)

The results of this study show that the integration of character education and peer dynamics significantly influences the formation of entrepreneurial spirit among modern pesantren students. With high validity and reliability on the character education and peer interaction variables, this finding addresses the gap in previous studies that did not comprehensively integrate these elements.

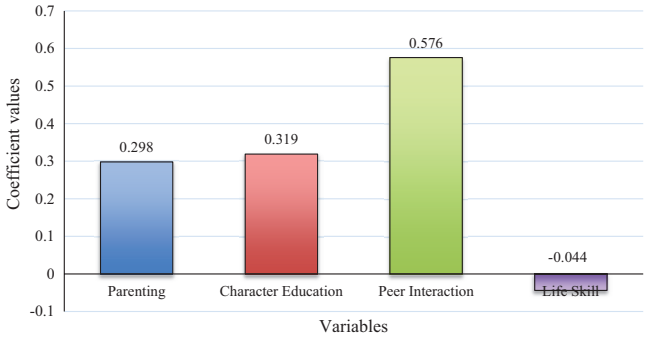

Figure 6 Coefficients of regression model
Source: Data processed (2024)

This strengthens the argument that combining character education with social dynamics in the pesantren curriculum can have a significant positive impact on the development of the entrepreneurial spirit of santri. This finding is supported by holistic education theory that emphasizes the importance of developing all aspects of an individual, both academic and moral.

This study also fills a gap in the literature that often overlooks the role of peer interaction in shaping entrepreneurial mindsets. The finding that peer interaction significantly influences student independence indicates that social dynamics among students can serve as a crucial catalyst in entrepreneurship education. This aligns with Gottlieb's (2022) social learning theory, which emphasizes that social interaction plays a key role in cognitive and emotional development. Therefore, it is essential for educational institutions to create environments that support positive interactions among students to maximize their entrepreneurial potential.

The quantitative approach used in this research successfully addresses the limitations of previous studies that predominantly used qualitative approaches. By employing validity and reliability tests, along with various other statistical tests, this study provides robust empirical data to support its findings. This allows for the development of more effective evidence-based practices in integrating character education, peer dynamics, and entrepreneurship. With quantitative data support, the results of this study can be more easily generalized and applied to various other pesantren contexts.

The results of this study also highlight the importance of enhancing educators' competencies in delivering integrated character and entrepreneurship education. The finding that character education and peer interaction significantly influence student independence underscores the need for specialized training for teachers in integrating these elements into their teaching. This supports the views of experts who argue that the quality of teaching heavily depends on the competency and readiness of educators to implement a holistic and integrative curriculum.

This research provides a solution to the challenges in curriculum integration that often treat elements of character education, peer dynamics, and entrepreneurship as separate components. By demonstrating that the integration of these three elements can enhance student independence and entrepreneurial spirit, this study supports the importance of a cohesive and holistic curriculum approach. This approach aligns with integrated curriculum theory, which emphasizes the importance of integrating various educational aspects to create a more effective and comprehensive learning experience for students.

The implementation of these findings is expected to help modern pesantren create a more conducive educational environment for fostering the entrepreneurial spirit among students.

To avoid the identified research issues, it is important for educational institutions and researchers to conduct comprehensive studies that integrate character education, peer dynamics, and entrepreneurship. Special training for educators should be conducted to improve their competence in implementing a holistic and integrative curriculum. Additionally, research approaches should include both quantitative and qualitative data to support the generalization of the results.

Conclusion

This study demonstrates that the integration of character education and peer dynamics has a significant influence on the development of entrepreneurial spirit among students in modern Islamic boarding schools (pesantren). The high validity and reliability test results for the variables of character education and peer interaction reinforce these findings. Data analysis also shows that character education and peer interaction collectively contribute significantly to student independence. These findings underscore the importance of a holistic and integrated approach in pesantren education to effectively develop students' character and entrepreneurial abilities.

Theoretically, these findings make a significant contribution to the literature on character education and entrepreneurship by highlighting the key role of peer interaction. Practically, this research offers concrete guidelines for educators and pesantren administrators to integrate elements of character education, social dynamics, and entrepreneurship into their curricula. This can help create an educational environment that supports the development of independence and innovation among students.

Although this study provides valuable insights, it has certain limitations. The study focused on one type of pesantren, which may limit the generalizability of the findings to other types of educational institutions. Additionally, the research approach was limited to quantitative methods, which may not capture the full complexity of the variables under study. The significance of this study lies in its practical and theoretical contributions. It provides a basis for future research to explore the impact of character education and peer interaction in different educational settings. Future studies are recommended to use larger samples and more diverse methodological approaches, including qualitative methods, to deepen the understanding and application of these findings in broader contexts.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Indonesian's pre-service history teachers' perspectives on teaching difficult history in the framework of peace education

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Abstract

Teaching traumatic violent events of the past is part of difficult history for most teachers. These burdens manifested and escalated when pre-service history teachers were asked to conceptualize lesson plans to teach difficult history topics, such as the killings of alleged *Dukun Santet* (sorcerers) in East Java around 1998. Through a sequential explanatory design, this study aims to explore the perspectives of 49 prospective history teachers in Indonesia. The results of this study indicate that their teaching perspectives are influenced and shaped by their historical perspectives in viewing the events to be taught. Meanwhile, their historical perspectives depend on their critical thinking level in analyzing primary sources. Three levels of critical thinking emerged, each determining the teaching perspective chosen by research participants. These three teaching perspectives can be implemented by history teachers who intend to teach difficult history in the context of peace education. In this framework, students are expected not only to understand what happened in the past but also be able to acquire lesson learned to prevent similar dark events being repeated in the future.

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Introduction

Teaching past conflicts and violent events with contested historical narratives can be difficult and frightening for teachers (Ahonen, 2018). However, it opens up opportunities to bring new strategies into the teaching of history (Lewis, 2021). More importantly, history lessons should be able to encourage students not only to learn about the past but also to learn from the past. This is because valuable lessons learned from the past can be beneficial for the present as well as the future, ensuring that the dark events of the past will not be repeated.

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Difficult history is an attempt to teach a sensitive, traumatic, or violent past (Ahmad et al., 2024), which sometimes has conflicting and controversial versions of history. One of the most violent conflicts in Indonesian history was the killings of alleged *Dukun Santet* (sorcerers) in 1998. In early 2023, the Indonesian government, through President Joko Widodo, acknowledged that this event was one of 12 serious human rights violations in the past (Ng, 2023). Various studies have been carried out to analyse this event historically (Brown, 1999; Cribb, 2000; Kasdi, 2001; Kusairi, 2021) as well as through the lens of other social sciences (Herriman, 2006; Retsikas, 2006). Unfortunately, there has been no study focusing on how this conflict should be taught to students so that it will not be repeated in the future. Of the 12 cases of gross human rights violations, most studies on teaching difficult history only focus on the 1965 affair (Djono et al., 2021; Pratama, 2022).

History lessons can enable students to have wisdom, including in building a more peaceful life. History education is believed to contribute positively to implementing peace education (Kayış & Pamuk, 2022). However, this contribution depends on the role and impact of teachers' affective practices in teaching difficult history within the framework of peace education (Zembylas & Loukaidis, 2021). Peace education practice should lead to benefits for students and society to experience and respect humanity (Reardon & Snauwaert, 2015). In providing beneficial experiences to students, teachers can utilise different learning strategies depending on their teaching perspectives.

To teach difficult history material requires an appropriate teaching perspective to be chosen in order to equip students with historical content and procedural knowledge. Therefore, it is also essential to study the historical perspective of pre-service history teachers on the material to be taught. This is because difficult history often burdens teachers with formidable challenges, which are often avoided (Kitson & McCully, 2005), although they can be used to stimulate students' historical thinking skills. By examining teachers' historical perspectives on difficult historical subjects, such as the killing of alleged sorcerers in East Java in 1998, a more complete background can be obtained regarding which teaching perspectives they believe are the best ways to teach.

The controversy behind the killing of the alleged sorcerers in East Java in 1998 is reflected in various historical sources which provide different accounts of the actual incident (Kusairi, 2021). Both primary and secondary sources have different explanations for the killings. Consequently, historians' interpretations of these incidents vary and often contradict each other (Brown, 1999; Kasdi, 2001; Herriman, 2006). This situation provides a tough challenge for teachers, especially pre-service teachers, in teaching these incidents to students. In addition, it is not easy to explain the killings caused by the belief that magic exists—something that cannot be explained logically and scientifically. However, many people in East Java—including teachers and students—believe that magic is real.

This study aims to explain the extent to which the historical and pedagogical perspectives of Indonesian' pre-service history teachers influence their teaching of the killings of alleged *Dukun Santet* in East Java in 1998. This study focuses on the teaching perspectives of pre-service teachers so that they would not avoid difficult history when they teach in schools. Therefore, it is necessary to first review the existing literature on the killings of *Dukun Santet*, in order to elicit their historical perspectives, consider the teaching perspectives that can be used, and to reflect on the utilization of history for peace education.

Literature Review

Historical and Socio-Cultural Context

The mass killing of alleged sorcerers in East Java from the second half of 1998 marked the beginning of political reform (*Reformasi*) in Indonesia after the fall of Suharto in May 1998. Prior to the *Reformasi*, there had also been several similar incidents, but they occurred in separate isolated cases in various East Java cities at different times. After the *Reformasi*, there was an explosion of cases that started in Banyuwangi and then spread to other cities in East Java. As in other parts of the world (Koning, 2013), most people in East Java still believe in occult powers, including the supernatural abilities possessed by the *Dukun Santet* (Campbell & Connor, 2000; Geertz, 2017). The term *Dukun* is commonly used in Indonesia to refer to someone who has supernatural power, which they use to resolve issues or even cause harm to others (Campbell & Connor, 2000; Gershman, 2022). *Dukun* who use their abilities for harmful purposes are often called *Dukun Santet* or sorcerers (Sartini & Ahimsa-Putra, 2017).

The main difficulty in reconstructing the historical context of the massacre is uncovering who was the mastermind behind the killing and what the motive was. Although there is no definite answer, from various previous studies, such can be grouped into two main

possible causes: namely, political motives and purely criminal reasons (Kasdi, 2001; Herriman, 2016; Juang et al., 2016). According to Juang et al. (2016), the central government pitted two Islamic organisations, Nahdlatul Ulama and Muhammadiyah, against each other. Unfortunately, Juang et al.'s (2016) arguments were not supported by historical data, and they mistakenly thought that Suharto had not been overthrown when the mass killings occurred. More robust historical data and arguments are presented by Cribb (2000), who considers that the primary motive for the incident was the military's attempts to return to power. Kasdi (2001) weighed the two motives in a balanced and comprehensive manner. They argue that, initially, the killings had a purely criminal intention to kill the alleged *Dukun Santet* but then shifted to being used for the political interest of certain parties. Herriman (2016) who conducted an in-depth anthropological study in East Java, concluded that the killings were caused by the opportunity that arose when the government was weak during the reformation era, and thus communities took advantage of this instability to eradicate the *Dukun Santet* through community justice. All the motives mentioned above could be true because a historical event may have multiple causes.

Historical Perspective

Historical perspective is the processing of thinking by historians to judge what might have happened in the past (Lévesque, 2008). Historians do this by attempting to look at the past through the eyes of those who lived at that time and are fully aware that the past was different from the present (Seixas & Morton, 2013). Therefore, historians must understand not only what happened in the past and how it occurred, but they must also be able to comprehend why people acted the way they did in the past. The results of the judgments made by historians sometimes differ, depending on the sources used and the interpretation they produce. Thinking processes like this should not only be carried out by historians but also by teachers who teach history and students who study history. Thus, a historical perspective is needed in thinking historically, even though it can be challenging in practice.

Pre-service teachers' historical perspectives are shaped by their developing epistemic beliefs towards history, which in turn influence their approach to teaching history for peace building. Therefore, it is necessary to study their current epistemic beliefs towards difficult history. Teachers' epistemic cognition can be divided into three levels based on their cognitive processes to consider criteria, boundaries, and the certainty of knowing (Maggioni et al., 2009). Similar criteria can also be used to assess teachers' own historical perspectives. The first level is 'the copier' (Maggioni et al., 2009) or 'naïve objective' stance (VanSledright, 2014), which is characterised by teachers who have a historical perspective who simply follow the version of historical sources studied without being analysed and evaluated. The second level is 'the borrower' (Maggioni et al., 2009) or naïve subjective stance (VanSledright, 2014), which is characterised by teachers who have a historical perspective after assessing and evaluating historical sources based on interpretations according to their own desires or pre-conceptions. The third level is 'the *criterialist*' stance (Maggioni et al., 2009; VanSledright, 2014), which is characterised by teachers who construct their historical perspective through critical analysis and evaluation of historical sources. Teachers' disciplinary perspectives influence their goals for instruction (Wineburg, 2001), so it is necessary to know in advance about their historical perspective before looking at their teaching perspective.

Teaching Perspective

A teaching perspective is a set of interrelated beliefs and intentions that provide meaning and justification for the actions taken by a teacher (Pratt, 1998). Every action the teacher takes reflects the belief that their action is considered the best way of teaching students. The teacher's teaching perspective will determine the strategies and methods they use in delivering the material. As a perspective, each teacher can have a different view of what approach is considered the best for teaching. For this this reason, it is important to study the teaching perspectives of pre-service history teachers who do not have much experience in teaching difficult history. Freire (2005) introduced two major views on the educational approach. First, the "banking concept of education" suggests that the best way to educate is by transmitting information from teachers to students, thus rejecting dialogue, inhibiting creativity, and domesticating student consciousness. Second, the "problem-posing education" aims to help students develop their strength critically through dialogue to understand their existence in the world and view it not as a static reality but as a transformative process.

Freire's two major approaches align with the three educational goals envisioned by Biesta (2015). In Biesta's view, education is a teleological practice with three-dimensional and interrelated educational goals:

qualification, socialisation, and subjectification (Biesta, 2015). Qualification views education as a process of transmitting and acquiring knowledge, skills, and understanding by students until they are deemed capable of doing something (Biesta, 2015). This goal has a similar perspective to Freire's banking concept of education. The function of socialisation enables students to become members of a particular social, cultural, and political order (Biesta, 2015). Subjectification views education as aiming to make students more independent in thinking and acting as a process of individuation (Biesta, 2015). Freire's 'problem posing education' has similarities with the educational purpose of subjectification. Freire's two approaches and Biesta's three educational goals, which are considered the best by teachers, will influence their teaching perspectives.

While teaching perspectives are implemented through technique, it is much more than teaching actions or strategies (Pratt, 1998; Pratt & Collins, 2000). All teaching actions reflect the decisions about what is right or wrong, effective or ineffective, based on their own criteria. Pratt (1998) introduces five teaching perspectives, namely, transmission, apprenticeship, developmental, nurturing, and social reform. The transmission perspective believes that the best way of teaching is through delivering content from the teacher to students accurately so that they reproduce the same content (Pratt, 1998). This perspective has similarities with Freire's banking concept of education. The apprenticeship perspective believes that teaching is a process of enculturating students into a specific community (Pratt, 1998), which aligns with Biesta's socialisation goal of education. The developmental perspective considers that the teacher's role is to develop students' way of thinking by giving them problems to solve (Pratt, 1998). The nurturing perspective aims to help students become more confident and self-sufficient learners so that they believe they can learn something valuable and relevant to their lives on their own (Pratt, 1998). The social reform perspective believes that teaching is ideological and aimed at changing society (Pratt, 1998). The five perspectives on teaching above can be used in all subjects, including history education.

Peace Education in History Education

Peace education is a responsive pedagogy that develops knowledge, skills, attitudes, and values for peace-building, solving conflicts by preventing or stopping violent frictions peacefully, and contributing to an environment of peace both individually and socially as well as nationally and internationally (Carter, 2008; Gurdogan-Bayır & Bozkurt, 2018). Peace education's central goal is teaching that proactively addresses violence (Carter, 2010). History education can play a pivotal role in creating peaceful relations because it studies the conflicts seen in the past through different historical narratives that are valued as essential features of a democratic and dynamic society (Elmersjö, 2015). Previous studies have shown that history education can be used to teach peace education in several ways, including through historical memory education (Corredor et al., 2018), historical empathy and inquiry (Kayış & Pamuk, 2022), multiple-perspective analysis (Carter, 2010), or teaching human rights with recent history (Almanza, 2022). It is crucial to study the teaching perspectives of pre-service history teachers in Indonesia when dealing with difficult history, such as the killings of *Dukun Santet* in East Java in the context of peace education, since in-service history teachers tend to avoid teaching difficult history. Through teacher professional education program, pre-service teachers can be trained to develop lesson plans that address difficult history topics in a way that promotes peace and understanding.

Methodology

Research Design

This study used a mixed-methods design because it combined both quantitative and qualitative data collection and analysis to answer research questions (Creswell, 2015). Specifically, it applied explanatory sequential design methods in order to use qualitative data to explain the quantitative data obtained in the first phase (Creswell, 2015; Creswell & Clark, 2018). Quantitative data was obtained from an open questionnaire that explored Indonesian preservice history teachers' historical and teaching perspectives before and after reading some historical sources. Qualitative data were obtained from classroom observations and interviews during and after participants were asked to make a lesson plan regarding the killing of the alleged *Dukun Santet*.

Research Participants

The participants in this study consisted of 49 pre-service history teachers who were taking the Teacher Professional Education (PPG) program at a teacher training institution in East Java. The selection of participants in this study was carried out through

purposive sampling based on consideration that they were taking a teacher education program in East Java and would later have the opportunity to teach history in this province. They were following a course on the Principles of Effective Teaching and Assessment, while involved in a workshop on the difficult history learning design examined through this study. The participants in this study voluntarily gave their consent before conducting the research. The names of the participants in this study were pseudonymized before the data analysis process to protect their privacy and confidentiality.

Data Collection

Quantitative data collection in this study used questionnaires to explore the historical and teaching perspectives of the participants. This study used an open-ended questionnaire to explore the participants' various perspectives to be then analyzed using descriptive statistics based on the emerging themes (Creswell & Clark, 2018). The questionnaire was administered twice, before and after the lesson plan workshop, which focused on teaching related to the killings of the alleged *Dukun Santet* in East Java. The result of the workshop was a lesson plan presented through group discussions.

Data collection through observation was conducted during a two-week workshop, with two weekly meetings, from June to July 2023. The purpose of the observation was to observe any changes, stagnation or regression in the participants' historical perspectives and teaching perspectives in a natural setting (Creswell, 2012). Before the workshop and after the first questionnaire, participants were asked to read extensively (Renandya, 2007) a total of 293 articles from newspaper sources throughout 1998. All the articles came from Jawa Pos, the largest newspaper in East Java and the third largest in Indonesia at that time, so the coverage was comprehensive and, at the same time, influenced the incident (Campbell & Connor, 2000; Herriman, 2015). This learning resource was used to enrich the historical perspective of the preservice history teachers who became research participants.

Qualitative data were collected through semi-structured interviews to deepen the findings obtained from questionnaires and observations (Creswell, 2012). These interviews explored the participants' historical and teaching perspectives. Informants were selected through purposive sampling related to the various findings of the themes that emerged from the observations and questionnaires (Seidman, 2006). The interview results were transcribed, and then member checking was carried out on the ten informants who were interviewed.

Data Analysis

Quantitative data from the questionnaires were analyzed using descriptive statistics to obtain the frequency of data based on the themes that appeared in the respondents' answers. Theme analysis of the qualitative data obtained from observations and interviews was carried out by encoding excerpts in interview transcriptions and observation fieldnotes. These excerpts were reviewed to find overarching patterns and generate a small number of codes which captured deeper patterns and themes.

Findings and Discussion

Demographical Background

The background of the research participants is important to this study's findings, especially regarding their belief in witchcraft. In terms of gender, of the forty-nine participants, 73.5 percent were female, and 26.5 percent were male. Their age range was 23-30 years, 44.9 percent of whom were born before 1998, and the remaining 55.1 percent in 1998 or after. All participants, both those born before and after 1998, admitted to being unaware of this incident either because at that time they were still children and did not know what was happening or simply because they had not yet been born. This finding is interesting because it turns out that Seixas & Morton's (2013) suggestion to pay attention to the perspectives of people who lived in that era cannot be used as an instant benchmark if the witnesses do not know precisely what happened or such happened when they were children.

Ethnically, most of the participants consisted of Javanese (93.9%), followed by Madurese (4.1%), and Mandarese (2%). Interestingly, even though they can be categorized as educated people in Indonesia because they have graduated from undergraduate programs, either in history (10.2%) or history education (89.8%), it turns out that most of them believe in the existence of sorcery (59.2%). There were only three persons among the participants who did not believe in sorcery solely because they felt they had never experienced it. As Nelvita stated, "because I still haven't experienced real witchcraft incidents in my environment." Likewise, the rest who said indecisive (34.7%) also reasoned, as stated by Aghmima, that "actually I myself don't really believe in witchcraft but seeing cases circulating in my community makes me more or less believe it."

The finding above could refute Gershman's (2022) claim that people with higher levels of education tend not to believe in witchcraft. However, this finding supports what Wessing (1996) found three decades ago, that many people in East Java still believe in witchcraft, including those with higher education and even university lecturers. Given the people in East Java still believe in witchcraft, opportunities to kill people accused of being Dukun Santet may be possible in the future. Therefore, through peace education, history teachers play a vital role in educating students as part of their society so that they do not repeat the same tragic events.

Historical Perspectives of the Participants

The provision of primary sources in the form of a collection of articles from the Jawa Pos newspaper affected the historical perspective of prospective history teachers who were participants in this study. In the first questionnaire, most of them (95.9%) admitted that they did not understand the details of the 1998 killing of the *Dukun Santet* in East Java. This is because their history teacher did not teach these killings when they were still in high school, even though the event was part of the material content of the 'Reformation 1998 in Indonesia' which must be taught in grade XII. Thus, it can be assumed that their teacher probably ignored the content because it was considered difficult history. However, two of them (4.1%) claimed to have learned about the incident since high school, not from a history teacher but from a religion subject teacher. Vitasari stated that the incident was "explained, but in religious subjects, not history subjects" and supported by Ritama's statement that "the discussion was more focused on how *Dukun Santet* works, nothing more."

After they read extensively the 1998 newspaper articles, the historical perspectives of each participant began to emerge. Through the second questionnaire, they were asked to describe the chronology, causes, motives, and consequences of the 1998 *Dukun Santet* massacre. In answering the four questions, each participant had different perspectives on what happened at that time. Despite these differences in perspectives, several themes emerge from the findings. These themes reflected intertwined patterns bound by similarities regarding how critically the participants read and analyzed sources. The findings' patterns show three levels of participants' critical thinking abilities in reading sources.

The first level is the lowest ability in reading sources and can be categorized as the 'uncritical thinking' group. Based on their answers to the questionnaire, their proportion was 24.5 percent among the participants. The pattern of their answers tended not to pay attention to the historical context, did not try to infer what the historical actors thought and felt as reported in the newspaper, and did not explore the range of perspectives and opinions (Enright, 2014). Participants who represent this group are those who, when asked what caused the *Dukun Santet* massacre, immediately referred to only one version of the news article without trying to analyze or compare it to other articles. Riswanti's answer can exemplify this: "According to an article I read, the community believed that witchcraft is very dishonorable and deserves to be eradicated." The historical perspectives of this group can be categorized as being at the level of 'the copier' or 'naïve-objective' (Maggioni et al., 2009; VanSledright, 2014).

The second level is the 'semi-critical' group, which has an intermediate historical perspective ability. Based on their answers to the questionnaire, this group constituted the majority, 61.2 percent among the participants. Unlike the previous group, they tried to explore and analyze different news articles to build their perspective. In addition, they also paid attention to the historical context of the killing of the *Dukun Santet* implied in the articles they read. Although they have explored various perspectives and opinions in newspaper articles (Enright, 2014), nevertheless, they seemed to create a perspective according to their own preferences after feeling that it was impossible to truly know what had happened in the past. When responding to a questionnaire asking what the motive for the killing of the *Dukun Santet* was, Nelvita, for example simply answered, "pure criminals, because none of the various newspaper articles provided clear arguments, from the [statements] of high-ranking officials to the public." When her answers were explored further through an interview, Nelvita replied, "yes, it's criminal [motive]. Even though there was no clear evidence, still as conjecture. That's why I also consider it to be political [motivated], so because the evidence isn't there yet, that's all." Her answer gave the impression that she had analyzed the sources, but her arguments were still superficial and, ultimately, were arbitrary conclusions without basis. Therefore, those at this 'semi-critical' thinking level can be categorized as 'the borrower' or 'naïve subjective' stance (Maggioni et al., 2009; VanSledright, 2014).

The third level consists of those who have been able to adopt a critical historical perspective. This 'critical' group were able to build a critically-inflected historical perspective because their answers in questionnaires and interviews tended to pay close attention to the historical

context, analyze what people thought and felt in the past, and explore various ranges of perspectives and opinions (Enright, 2014). The number of participants who could be included in this category was only seven prospective history teachers or around 14.3 percent. One of them was Elnindi, who, when asked to explain in the questionnaire what the cause, effect, and motive of the incident was, gave arguments containing multiple causes, multiple effects, and various possible motives by referring to newspaper articles and other sources. She explained her argument in the interview by providing a historical context analysis. Elnindi explained that the factors causing the massacre were influenced by the conditions at that time "because the situation in that year, 1998, was not yet stable, then there were many interests of certain people to take advantage of the incident, resulting in a crisis of public distrust of the government." Therefore, since they have been able to construct historical perspectives critically, this third level is equivalent to 'the *criterialist*' stance (Maggioni et al., 2009; VanSledright, 2014). Referring to the three levels found above, what follows is a discussion about how they relate to their teaching perspectives.

Teaching Perspectives of the Participants

The data about participants' teaching perspectives presented in this section were obtained from questionnaires, observations during lesson plan workshops, and interviews. The three data collection techniques focused on exploring the participants' perspectives on the best way to teach the killing of *Dukun Santet* in East Java. The participants' responses were transcribed and coded based on frequently emerging themes until overarching patterns were obtained. Through the theme analysis, three categories of teaching perspectives emerged. Therefore, these three categories emerged from the teaching perspectives of pre-service teacher participants when responding to the questionnaire, preparing lesson plans, and were then confirmed through interviews.

The first teaching perspective is those who think that the best way to teach the content of the massacre of *Dukun Santet* in East Java is to explain it directly to students. This category can be called a 'delivering' teaching perspective and has similar characteristics to Pratt's (1998) 'transmission' perspective, Freire's (2005) 'banking concept of education', and Biesta's (2015) 'qualification' perspective. There were 22 participants (44.9%) who fell into this category. This teaching perspective category is related to the participants' historical perspective category; it turns out that they come from two levels of critical thinking. Those with a 'delivering' teaching perspective came from participants at the 'uncritical' (40.9%) and 'semi-critical' (59.1%) thinking levels.

The teaching perspective in the 'delivering' category was reflected in the views of some of the participants in the questionnaire. For example, this was conveyed by Merithor, who believes, "I will tell this dark history [to students] in a coherent manner starting from the causes and consequences of the incident." In the same vein, Madyawati said, "I will convey more positive values or what lessons can be drawn from the incident so that it does not happen again in the future." The two examples above show that the teaching is teacher-oriented: teachers transmit information to students (Pratt, 1998) in a narrative manner (Lévesque, 2008). When examined more deeply through interviews, the explanation for the emergence of this 'delivering' perspective could be due to the difficulties teachers face in teaching controversial material. This was explained by Merithor that "because it's too controversial, Sir. [I'm afraid] the students will perceive it differently, that's too controversial." Therefore, according to this perspective, the easiest way to overcome this trouble is to teach the controversial history according to the teacher's version so that students are not presented with conflicting views.

The second teaching perspective is those who think that the perfect way to teach difficult history is by allowing students to explore the incident themselves. The core patterns of this category are related to Pratt's (1998) 'developmental' teaching perspective, Freire's (2005) 'problem-posing' education, and Biesta's (2015) 'subjectification' function of education. This category can also be called a 'collecting' teaching perspective because students are given the freedom to construct their own historical perspective based on the sources they have collected. There were 24 participants (49%) who could be categorized as having this 'collecting' teaching perspective. Those with this teaching perspective apparently came from historical perspectives at the 'semi-critical' (70.8%) and 'critical' (29.2%) thinking levels.

Those whose teaching perspective is in the 'collecting' category were identified from their answers in questionnaires and interviews. A striking example is the answer from Nitrilia, who stated that she would teach the incident of the alleged *Dukun Santet* killing 'by assigning students to do a mini-investigation with newspaper sources so that they know about the incident." Regarding the learning model to be used, Elnindi stated, "I will use a problem-based learning (PBL) model."

She explained it further through interviews, "I will provide various newspaper articles from various regions [in East Java] and give enough time [to investigate] so that students know that it didn't happen once and knowing the pattern so that they can take the underlying causes." Thus, paticipants in this category emphasize the importance of using primary sources as learning resources that are studied independently by students.

The third teaching perspective is those who believe that the best strategy to teach incidents related to witchcraft is to relate it to the cultural aspect prevailing in the environment around the school where students come from. This category can be called a 'connecting' teaching perspective and has similar characteristics to Pratt's (1998) 'apprenticeship' perspective and Biesta's (2015) 'socialization' purpose of education. Within this perspective, teaching is the process of enculturating students into specific community, social-cultural, and political orders. Only three participants (6.1%) fell into this category, and all came from groups with a historical perspective at the 'uncritical' level. Previously, the three participants fell into the 'uncritical' category because they were at the 'naïve-objective' level who did not dare to draw conclusions regarding the cause of the incidents due to too many conflicting sources, even though they had tried to analyze the background and context of various sources.

The three participants in the 'connecting' teaching perspective category believed that the best way to teach the incident was through the Culturally Responsive Teaching (CRT) approach. Riswanti's response to the questionnaire stated, 'We can use the CRT approach so that students can understand the material within the scope of the surrounding environment so that this event does not happen again in the future." In the interview, Riswanti reiterated that "by taking the CRT approach, we chose incidents that were around Malang area that could be studied in class. Then I gave them the problem: did this incident really happen or not? and then, how to prevent this from happening again?" In the same perspective, Anjaya gave the reason for using the CRT approach was to comprehend the cultural background of historical actors in order "to understand from the point of view of perpetrators and victims." Therefore, they emphasize the importance of the context and situation in which they teach and the significance of training intending to adapt students to local cultures (Pratt, 1998).

The three categories of teaching perspectives described above are the participants' views on teaching difficult history, using the killing of alleged *Dukun Santet* in East Java in 1998 as the case study. All these teaching perspective categories simply reflect the results of participants' decisions about what is wrong or right, effective or ineffective, based on their own criteria (Pratt, 1998). The findings of this study indicate that the participants' teaching perspectives are more or less influenced by their historical perspectives in studying the events to be taught. These findings can also be used to consider how to teach the killing of alleged *Dukun Santet* in East Java in the context of peace education.

Peace Education in Teaching Difficult History

Referring to the three categories of teaching perspectives in the findings above, three ways are offered to teach the incident of the *Dukun Santet* massacre in East Java within the framework of peace education. The three teaching perspectives have the same goal of how to prevent similar killings from happening again in the future. Because the people of East Java, in general, still believe in the existence of magic and sorcerers who can harm other people, this does not pre-empt future incidents, but at least enables the teachers and their students to be more aware of the causes and consequences.

The first strategy is to explain directly to students how the massacre of alleged *Dukun Santet* occurred. Teachers can choose this strategy if they are worried that there will be differences and disputes in students' views because the material being studied is too controversial. This kind of material delivery also makes it easier for teachers to convey advice to students so that the same incident does not happen again. However, this strategy has weaknesses because it is teacher-centered and does not allow students to construct their own knowledge or draw valuable lessons learned to avoid a similar massacre. Teachers who want to use this strategy can complement the narrative with historical memory education (Corredor et al., 2018) which conveys the memory of historical actors or witnesses.

The second strategy is to provide opportunities for students to study independently the incident through analyses of historical sources, especially in the form of newspaper articles published in 1998. So, the historical knowledge obtained and what efforts can be made to prevent the occurrence of the same killings are the results of the students' own construct. The weakness is that the teacher or students must collect their own resources, and there can be protracted differences of opinion in class. Teachers who want to use this strategy can emphasize the application of teaching multiple perspectives and analysis to students, as offered by Carter (2010).

The third strategy that can be offered from the findings of this study is teaching peace education through connecting with students' cultural backgrounds. Teachers must pay attention to the culture that is believed by students and their community environment so that the material and manner of teaching do not conflict with these beliefs. The advantage of this strategy is that it will not undermine the students' local culture, but it will become an obstacle if the local culture justifies and supports the practice of witches. To implement this strategy, teachers can apply historical empathy suggested by Kayış & Pamuk (2022). The relation between the historical perspective and the teaching perspective described above can be visualized through the following Figure 1

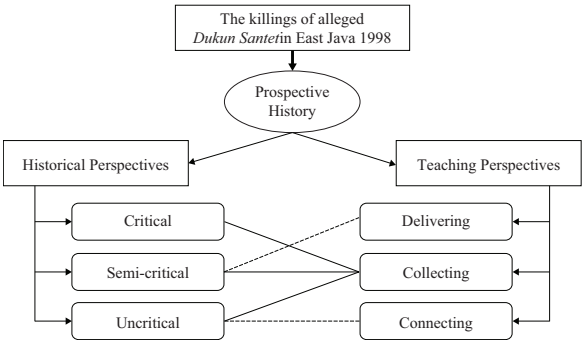

Figure 1 Patterns of historical and teaching perspectives of the participants

Conclusion and Recommendation

Teaching difficult history is challenging for most teachers. This is evident from the results of this study, which showed that pre-service history teacher participants' experienced difficulties when asked to develop a lesson plan for teaching the killing of alleged *Dukun Santet* in East Java in 1998. In the quantitative phase, when asked to analyze primary sources related to the incident, it turns out that the participants' historical perspectives were influenced by their level of criticality in analyzing the sources while in the qualitative phase, when asked to prepare a lesson plan, it was discovered that the participants had different teaching perspectives which were influenced by their historical perspectives. Therefore, it can be concluded that to teach difficult history, teachers must have a critical historical perspective in order to have a solid teaching perspective. This study also recommends further research to examine the three teaching perspectives that emerged in this study to be tested on their influence on students' critical thinking skills in learning difficult history.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Secondary school academic management strategies based on the concept of skills development for the green economy

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Abstract

The aim of this analysis was to examine the strengths, weaknesses, opportunities, and threats related to academic management in secondary schools, as well as to develop academic administration management strategies based on the concept of skills development for the green economy. The study applied a multi-phase mixed method. In the first phase of the study, a multi-stage random sampling method was used to select 341 secondary schools to comprise survey groups. The school director, head of academic affairs, head of each subject department, and academic teachers at each school were among the 1,705 providers approached to participate. Five-level rating scale questionnaires were used in this analysis, and 70.56 percent of the distributed questionnaires were returned. Frequency distribution, percentages, means, standard deviations, $PNI_{Modified}$, and content analysis were used to analyze the data. Based on the results of the first phase, a focus group was conducted to create academic administration management strategies. Three main strategies were identified for managing academic administration, which include: (1) to establish educational institutions in order to improve the green environment curriculum, which includes 2 sub-strategies; (2) to improve the standard of teaching and learning to develop students' skills for the green economy, which includes 2 sub-strategies; and (3) to modify the evaluation and appraisal of student learning capabilities for the green economy, which includes 2 sub-strategies.

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Introduction

In the past century, globalization, especially in the industrial sector, has expanded rapidly. Economic development progressed from a resource-based economy to the present innovation-led economy, which is an economy driven by knowledge (Drucker, 1999). However, changing and expanding the global economy without effective preparation can have a significant impact on the environment. For example, the Office of Natural Resources and Environmental Policy and Planning, Ministry of Natural Resources and Environment,

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Thailand (2017) reported that, in 2015 and 2016, the most critical environmental concerns were the dual problems of climate change and global warming. Furthermore, the Food and Agriculture Organization of the United Nation (2016) found that the amount of global forest was decreasing by 0.13 percent per year, mostly in Africa and South America. Moreover, many areas of the world suffered from water shortages, degradation of habitats and ecosystems, and threats to plant and animal species as well.

Due to economic development and population growth, the importance and urgency of the problems of natural resource and environmental degradation are globally recognized. The United Nations Conference on Environment and Development (UNCED) introduced the concept of sustainable development, which has been further developed to include green growth concepts and low-carbon development. The focus is on maintaining consistent economic growth in order to secure people's livelihoods. At the same time, the growth must be environmentally sustainable. The sustainability trend has become ever more widespread and accepted. The Rio+20 conference reaffirmed its commitment to tackling the green economy issue in the direction of poverty alleviation and sustainable development. At Rio+20, the concept of the "green economy" was highlighted as a crucial instrument for sustainable development that emphasizes the convergence of economic, social, environmental, and governance aspects (United Nations, 2012).

In Thailand, environmentally friendly development has been officially promoted since the 11th National Economic and Social Development Plan was adopted. However, the Office of the National Economic and Social Development Board reported that in 2017–2018, the growth rate of gross domestic product (GDP) in the industrial sector was relatively low and could actually decrease. Moreover, models of industrial development in Thailand found that the system was heavily dependent on export, focused on low-cost employment, and that it lacked technology for industrial development and environmental care in production (Ngamjitanan, 2018, p. 4). Therefore, it is important for all parties to review and create a new development model that focuses on industrial development that is driven by technology that increases labor productivity and enhances environmental protection.

Education is an important tool in developing high quality of life, and helping people achieve their potential. The education system is responsible for helping youth to be knowledgeable and capable, and to help develop appropriate attitudes, values and morals following the standards in the curricula. According to Arasinah et al. (2016), skills development for the green economy should be implemented urgently from the time students are in elementary school onwards in order to produce responsible and capable citizens, and to preserve the environment. Skills development for the green economy is an educational element that can be added to or integrated with the curricula and other programs for students. Although the importance of developing people's skills for a green economy has been widely recognized, educational management for developing these skills has not yet been implemented in Thailand. Therefore, we explore the needs for academic management based on the concepts of skill development for a green economy and create an academic management strategy for secondary schools based on the same concept.

Literature Review

Secondary School Academic Management

Academic administration pertains to the efficient and advantageous management of all activities associated with the enhancement of educational quality, including teacher development, curriculum creation, teaching and learning, and evaluation, with the goal of fulfilling curricular objectives (Fry et al., 2009). Since academic administration is regarded as the center of activities in educational institutions, it must be aligned with established goals, and it must prioritize advantages that will accrue to students. Executives must also pay attention to, give value to, and recognize the significance of academic administration. In accordance with educational standards, this will result in the successful growth of students and assist them in achieving their desired goals. Curriculum creation, teaching and learning management, and assessment and evaluation are its three main components (Faber & Shearron, 1970; Ministry of Education, Thailand, 2007; Sergiovanni et al., 1981).

1. *Curriculum creation* is a term used to describe initiatives or plans for instruction that are developed and decided upon by educational establishments. The objectives, policies, procedures, and activities utilized to structure learning experiences, standards for monitoring and assessing academic progress, and guidelines for assessing and refining curricula are all included in the process of curriculum creation (Keesukphan, 1982; Oliva, 2008; Saylor et al, 1981).

2. *Teaching and learning management* includes setting up classes so that students can learn in accordance with the curriculum's content, and generate new information through independent thought. In order to improve understanding and be able to apply knowledge in their daily lives, kids should be encouraged to learn by doing (Asavapoom 2008; Kohtbantau, 2009; Wongnutaroj, 2010).

3. *Measurement and evaluation* looks at the outcomes of teaching and learning in three areas: knowledge, process skills, and desirable characteristics in accordance with the learning objectives according to the goals and principles of the curriculum. These are crucial parts of teaching and learning, and they should be part of a data feedback process in academic administration (Asavapoom, 2008). Regulations and guidelines govern measurement and evaluation in accordance with actual-life situations, including the creation of instruments for measurement and evaluation that adhere to standards.

Skills for Green Economy

The green economy and green work are concepts that prioritize improving quality of life and equality. Reducing environmental risks, adverse effects of human activity, and the scarcity of natural resources and ecosystems are all necessary aspects of these green concepts. Although the skills that are necessary for the green economy remain unclear, three phrases are used by academics and organizations to refer to these skills: green skills, green job skills, and skills for a green economy; these three terms are sometimes used interchangeably and have comparable meanings. Cedefop (2010) and Martinez-Fernandez et al. (2010) have proposed the idea that the development of a low-carbon economy depends on improving existing skills rather than developing specific green skills.

Through investigation of documents and by conducting research, eight skills for the green economy have been identified:

1. *Adaptability, learning, and transferable skills related to sustainable development and environment awareness (ALTs)* — These are skills that workers use to change their thinking processes, and to be ready to learn about sustainable development concepts and practices. Since the use of new technology or processes is necessary for operations to achieve sustainable development, these skills include the ability to transfer that knowledge to coworkers. According to Strietska-Ilina et al. (2011), workers should acquire and use new technologies and processes that are required to build their green occupations with the support of these transferable and adaptive skills. Pavlova and Huang (2013) suggested that environmental awareness, attitude, and openness to learn about sustainable development are other critical components of green skills that will improve workers' capacity for green work.

2. *Leadership skills for a sustainability economy (Ls)* — These comprise the abilities to plan, develop, and implement strategies; to take the lead in managing regulations and quality; to plan and allocate resources; and to plan human resources in a way that promotes low-carbon industry and energy efficiency. According to Department for Environment, Food and Rural Affairs [DEFRA] (2008), having these abilities will support efficient resource management, impact assessment, comprehension of low-carbon activities, and spatial planning.

3. *Coordination and management skills for the environment (CMs)* — These are skills that are employed in managing and organizing resources amongst teams or organizations, as well as in coordinating communications and coordination between individuals in an effort to accomplish objectives related to economics, society, and environmental preservation. As stated by Pavlova and Huang (2013) and Strietska-Ilina et al. (2011), these skills support the ability to choose the best course of action, and to accomplish goals; they also support comprehensive, multidisciplinary initiatives to accomplish social, economic, and ecological goals.

4. *Systems and risk analysis skills for sustainability (SRs)* — These are abilities that practitioners and entrepreneurs employ to evaluate risks in order to address new issues; examine cost-benefit, carbon, and resource scarcity; and assess, interpret, and comprehend necessary modifications and actions. Based on Pavlova and Huang (2013), green job creators should comprehend the reasoning behind the quickly expanding economy and how it varies from the traditional model. It takes research abilities, systems thinking, and analytical thinking to build the conventional linear approach using such knowledge.

5. *Designing and using innovation skills to promote the environment (DIs)* — This competency is centered on workers' knowledge and inventiveness in problem-solving or manufacturing new items in response to individuals or clients, as well as offering beneficial new services, goods, or procedures that are valued or have the potential to add value. The innovations that emerge will improve resource efficiency, lower carbon emissions, defend against environmental deterioration, and avert energy and carbon shortages.

One such breakthrough will involve creating things that can be recycled. Both Pavlova and Huang (2013) and Strietska-Ilina et al. (2011) concur that innovation skills will help green practitioners and entrepreneurs see opportunities and develop fresh approaches to address environmental concerns.

6. *Entrepreneurial, marketing and business skills for the environment (EMBs)* — These are competencies utilized in the creation and operation of companies to develop and take advantage of low-carbon technology prospects to improve business operations (Pavlova & Huang, 2013; Strietska-Ilina et al., 2011). This is done by organizing and carrying out marketing campaigns to highlight a company's eco-friendly goods and services. Green jobs are those that require enhanced goods, services, and procedures to address environmental and climate change (Cedefop, 2010). Skills in marketing are consequently required to increase a product's popularity.

7. *Language, communication and negotiation skills for the value of environmentally friendly operations in the environment (LCNs)* — These are fundamental skills needed for all jobs. The capacity to communicate in multiple languages, verbally and in writing, including negotiating to inspire and recognize team and individual accomplishments, will keep employees motivated and in harmony. These skills help enhance the perceived value green work and help to minimize disagreements and disputes in operations.

8. *Networking and information technology skills to connect the creation of work that is environmentally friendly (NITs)* — These skills comprise another essential ability for functioning in the twenty-first century, and range from knowledge of fundamental information technology usage to expertise in information technology. It is necessary for businesses to effectively conduct operations in a global market that is a green market.

Methodology

The objectives of this study were (1) to analyze the need for development of secondary school academic management based on the concept of skills development for a green economy, and (2) to develop strategies for secondary school academic administration based on the concept of skills development for a green economy. The study used a multiphase-mixed method to collect both qualitative and quantitative data. First, the researcher collected quantitative data using the current and desirable conditions of secondary school academic management based on the concept of skill development for the green economy as a research tool. Information was collected by postal delivery and collection. Next, the researcher uses the quantitative data collected to analyze the priority need index. Then, the researcher created a draft strategy for experts to participate in group discussions using a strategic evaluation form as a research instrument. Finally, the researcher improved it into a complete strategy based on the recommendations obtained from the focus groups.

Participants

The population in this study comprised 2,358 secondary schools under the Office of the Basic Education Commission in 2019; these schools were located in the Northern, Northeastern, Central, Eastern, and Southern regions of Thailand. The sample size was calculated using Yamane's sample size calculation at a 95 percent confidence level. Multi-stage sampling was used. The population was categorized into four groups based on the school size criteria of schools under the Office of the Basic Education Commission: small, medium, large, and extra-large. The sample size was then determined by ratio as indicated in Table 1 after the population was split into 5 regions: Bangkok, Northern, Northeastern, Central Western and Eastern, and Southern.

Table 1 Number of population and sample size

Regions	Schools under the Office of the Basic Education Commission						
	Population	Percentage	Sample size	School size			
				Small	Medium	Large	Extra large
Northern	455	19.3	66	16	16	17	17
Northeastern	933	39.6	135	33	34	34	34
Central Western and Eastern	517	21.9	75	18	19	19	19
Southern	334	14.2	48	12	12	12	12
Bangkok	119	5.0	17	4	4	4	5
Total	2,358	100	341	83	85	86	87

Note: The sample groups used in this study comprised 1,203 randomly selected providers, including school administrators, heads of academic affairs, heads of subject departments, and academic teachers for each school.

Research Instruments

The Questionnaire on the Current and Desirable States of Secondary Schools Academic Management Based on the Concept of Skill Development for Green Economy was created to gather perspectives from school directors and teachers. A 5-point Likert-like measurement scale, which ranged from strongly disagree "1" to strongly agree "5", was employed. There were 4 sections of this questionnaire: the basic demographic questions (i.e. age, gender, level of education, current position), and opinions about internal factors in academic management — curriculum, instruction and evaluation, combined with skills development for a green economy. Finally, participants were asked about their views of external influences, namely, political, economic, social, and technology effecting skills development for a green economy in schools.

Validity and Reliability

The content validity of the questionnaire was identified with respect to this instrument by analysis of relevant literature and evaluation of academics who actively contribute to the education commission. Item-Objective Congruence Index (IOC) was used to calculate the validity.

The research ethics review committee for research involving human subjects — the second allied academic group in social sciences, humanities and fine and applied arts, Chulalongkorn University — also approved the study in accordance with the International Conference on Harmonization — Good Clinical Practice (ICH-GCP).

A group of thirty school directors and teachers were randomly selected for a pilot study to ensure the reliability of the method. In each segment, the respondents were asked to provide input on the clarity of the items in the tool. After that, the pilot test was conducted using the Statistical Package of Social Science (SPSS) Statistics 21 to assess the reliability test. Cronbach's alpha for each segment was higher than 0.7, showing that there was a strong internal consistency between the items.

Data Analysis and Reliability

Descriptive analysis was used to address the first study query, in which the current state and desirable state were evaluated by calculation of means and standard deviations. The $PNI_{modified}$, was based on the Equation (1)

$$PNI_{modified} = (I - D) / D \quad (1)$$

Wongwanit (2007) was later used to measure appraisal requirements. The TOWS matrix was used to analyze the possible techniques in order to address the second research question by using the $PNI_{modified}$ index to identify the strengths, weaknesses, opportunities, and threats.

Following completion of the feasibility review, a focus group was formed, consisting of eight staff, researchers, and professors with expertise or experience, each of whom had familiarity with scholarly practices related to academic management and skills development for a green economy.

Results and Discussion

The Current and Desirable States of Secondary School Academic Management Based on the Concept of Skills Development for a Green Economy

Table 2 presents the current state (D), the desirable state (I), and the needs (PNI) of assessment of the internal factors, while Table 3 presents The SWOT table with the analysis of the internal factors. Table 2 shows the needs of secondary school academic management based on the concept of skills development for a green economy, classified by skill. The skill with the highest needs index is SRs ($PNI_{modified}$ = 0.404), followed by DIs ($PNI_{modified}$ = 0.393), and EMBs ($PNI_{modified}$ = 0.388), respectively. The skill with the lowest need index is NITs ($PNI_{modified}$ = 0.328). This shows that a student's cognitive development is still the fundamental goal of school. However, students' skills needed for future work are not being developed well enough, particularly in the areas of risk assessment, innovation development and utilization, and entrepreneurial abilities.

The skills that comprise common weaknesses (Table 3) reflect that the current academic administration does not promote these skills as effectively as they should. This might result from the fact that course syllabi, subject contents, learning standards, and other indicators tend to remain relatively stable over time. Consequently, educational establishments are unable to autonomously oversee or modify the curriculum. It is likely that the only ways available to develop abilities are through indirect methods such as extracurricular activities or projects run by other organizations. Therefore, it is imperative to strengthen these three skills via curriculum development, teaching and learning management, and assessment and evaluation as quickly as possible.

Table 2 The current state (D), the desirable state (I), and the needs (PNI) of assessment of the internal factors

Skills for Green Economy	Topic	Academic management							
		The internal factor					Average	Level	SEQ.
		Curriculum development	Teaching and learning management		Measurement and evaluation				
			Planning	Instruction	Setting the criteria	Tools development			
1. ALTs	D	3.59	3.30	3.40	3.09	3.18	3.31	Low	6
	I	4.51	4.52	4.51	4.42	4.44	4.48		
	PNI	0.256	0.370	0.326	0.434	0.396	0.353		
2. Ls	D	3.43	3.13	3.30	3.02	3.11	3.21	High	4
	I	4.44	4.45	4.50	4.42	4.40	4.44		
	PNI	0.294	0.422	0.364	0.464	0.415	3.83		
3. CMs	D	3.46	3.19	3.34	3.05	3.14	3.24	High	5
	I	4.47	4.45	4.47	4.43	4.43	4.45		
	PNI	0.292	0.395	0.338	0.452	0.411	0.375		
4. SRs	D	3.30	3.09	3.23	3.00	3.07	3.14	High	1
	I	4.39	4.40	4.44	4.40	4.39	4.40		
	PNI	0.330	0.424	0.375	0.467	0.430	0.404		
5. DIs	D	3.35	3.15	3.27	3.04	3.13	3.19	High	2
	I	4.44	4.46	4.48	4.43	4.40	4.44		
	PNI	0.325	0.416	0.370	0.457	0.406	0.393		
6. EMBs	D	3.15	3.05	3.16	3.36	3.04	3.15	High	3
	I	4.32	4.39	4.42	4.35	4.39	4.37		
	PNI	0.371	0.439	0.399	0.295	0.444	0.388		
7. LCNs	D	3.29	3.54	3.22	3.42	3.11	3.31	Low	7
	I	4.44	4.41	4.45	4.40	4.40	4.42		
	PNI	0.350	0.246	0.382	0.287	0.415	0.334		
8. NITs	D	3.34	3.56	3.27	3.45	3.15	3.35	Low	8
	I	4.48	4.46	4.49	4.41	4.43	4.45		
	PNI	0.341	0.253	0.373	0.278	0.406	0.328		

Table 3 The SWOT table – the analysis of the internal factors

Skills for Green Economy	Academic management				
	SWOT Analysis ($PNI_{Modified}$ index)				
	Curriculum development	Teaching and learning management		Measurement and evaluation	
		Planning	Instruction	Setting the criteria	Tools development
1. ALTs	S1 (0.256)	W6 (0.370)	S1 (0.326)	W5 (0.434)	W8 (0.396)
2. Ls	S3 (0.294)	W3 (0.422)	W6 (0.364)	W2 (0.464)	W3 (0.415)
3. CMs	S2 (0.292)	W5 (0.395)	S2 (0.338)	W4 (0.452)	W5 (0.411)
4. SRs	W4 (0.330)	W2 (0.424)	W3 (0.375)	W1 (0.467)	W2 (0.430)
5. DIs	W5 (0.325)	W4 (0.416)	W5 (0.370)	W3 (0.457)	W6 (0.406)
6. EMBs	W1 (0.371)	W1 (0.439)	W1 (0.399)	S3 (0.295)	W1 (0.444)
7. LCNs	W2 (0.350)	S1 (0.246)	W2 (0.382)	S2 (0.287)	W3 (0.415)
8. NITs	W3 (0.341)	S2 (0.253)	W4 (0.373)	S1 (0.278)	W6 (0.406)
Total	S1 (0.319)	S2 (0.357)		W1 (0.401)	

Note: The SWOT analysis table was generated using the $PNI_{Modified}$ index and divided into two groups: Strengths and Weaknesses. These were separated by using the highest $PNI_{Modified}$ index – the lowest $PNI_{Modified}$ index of each item and divided by two. Each PNI is listed in the strength section if it exceeds half of the previous calculation; otherwise, it is in the weakness section.

Table 4 presents the current state (D), the desirable state (I), and the needs (PNI) of assessment of the external factors, and Table 5 shows the SWOT table and analysis of the external factors. Table 3 shows the needs of secondary school academic management based on the concept of skills development for a green economy classified by external factors. The factor with the highest needs index is socio-cultural factor ($PNI_{modified}$ = 0.361), followed by economic factor ($PNI_{modified}$ = 0.338), and political and policy factor ($PNI_{modified}$ = 0.335), respectively. The factor with the lowest need index is technological factor ($PNI_{modified}$ = 0.304). This study shows that effective use of resources is not highly valued in Thai culture, and academic administration in secondary schools is not encouraged or supported in its efforts to equip students with skills relevant to the green economy.

Table 4 The current state (D), the desirable state (I), and the needs (PNI) of assessment of the external factors

External factor	Topic	Academic management					
		Curriculum development	Teaching and learning management	Measurement and evaluation	Average	Level	SEQ.
1. Political and policy Analysis	D	3.26	3.27	3.29	3.27	High	3
	I	4.35	4.41	4.34	4.37		
	PNI	0.334	0.349	0.319	0.335		
2. Economic Analysis	D	3.06	3.46	3.36	3.28	High	2
	I	4.41	4.40	4.39	4.39		
	PNI	0.451	0.272	0.307	0.338		
3. Social Analysis	D	3.11	3.22	3.43	3.25	High	1
	I	4.43	4.44	4.42	4.42		
	PNI	0.424	0.379	0.289	0.361		
4. Technological Analysis	D	3.48	3.22	3.52	3.41	Low	4
	I	4.43	4.48	4.45	4.45		
	PNI	0.273	0.387	0.264	0.304		

Table 5 The SWOT table – the analysis of the external factors

External factors		Skills for Green Economy								
		SWOT Analysis ($PNI_{Modified}$ index)								
		Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6	Skill 7	Skill 8	Total
Political	Curriculum development	T3	T1	T2	O1	O2	O5	O6	O4	T3
	(O2; 0.334)	(0.424)	(0.455)	(0.427)	(0.271)	(0.283)	(0.296)	(0.294)	(0.292)	(0.335)
	Teaching and learning management	O1	O4	O3	O5	O2	T1	O7	O5	
	(T1; 0.349)	(0.324)	(0.349)	(0.348)	(0.354)	(0.345)	(0.365)	(0.355)	(0.354)	
	Measurement and evaluation	T1	O1	O2	O5	O3	O7	O6	O4	
	(O1; 0.319)	(0.392)	(0.299)	(0.304)	(0.319)	(0.316)	(0.340)	(0.324)	(0.318)	
Economic	Curriculum development	T6	T1	T4	T3	T6	T1	T8	T5	T2
	(T1; 0.451)	(0.444)	(0.462)	(0.455)	(0.457)	(0.444)	(0.462)	(0.443)	(0.446)	(0.338)
	Teaching and learning management	O1	O2	O3	O6	O4	O8	O7	O4	
	(O1; 0.272)	(0.246)	(0.269)	(0.271)	(0.276)	(0.272)	(0.298)	(0.278)	(0.272)	
	Measurement and evaluation	O2	O3	O6	O7	O5	O8	O4	O1	
	(O2; 0.307)	(0.295)	(0.310)	(0.318)	(0.325)	(0.317)	(0.328)	(0.313)	(0.266)	
Socio-cultural	Curriculum development	T8	T5	T7	T2	T4	T1	T3	T6	T1
	(T1; 0.424)	(0.393)	(0.424)	(0.421)	(0.434)	(0.429)	(0.446)	(0.431)	(0.422)	(0.361)
	Teaching and learning management	T6	T1	T4	T2	T5	T3	O1	O2	
	(T2; 0.379)	(0.424)	(0.439)	(0.431)	(0.437)	(0.426)	(0.432)	(0.248)	(0.253)	
	Measurement and evaluation	O1	O2	O4	O7	O2	O8	O5	O6	
	(O1; 0.289)	(0.258)	(0.281)	(0.285)	(0.301)	(0.281)	(0.305)	(0.288)	(0.290)	
Technological	Curriculum development	O5	O6	O7	O8	O1	O4	O3	O2	O1
	(O2; 0.273)	(0.278)	(0.282)	(0.284)	(0.289)	(0.249)	(0.271)	(0.269)	(0.268)	(0.304)
	Teaching and learning management	T7	T5	T6	T2	T3	T1	T4	T8	
	(T1; 0.387)	(0.379)	(0.386)	(0.383)	(0.398)	(0.391)	(0.403)	(0.387)	(0.372)	
	Measurement and evaluation	O1	O2	O3	O5	O4	O8	O7	O6	
	(O1; 0.264)	(0.244)	(0.257)	(0.263)	(0.265)	(0.264)	(0.282)	(0.278)	(0.269)	

Note: The SWOT analysis table was generated using the $PNI_{Modified}$ index and divided into two groups: Opportunity and Threat. These were separate from the highest $PNI_{Modified}$ index – the lowest $PNI_{Modified}$ index of each item and divided by two. Each PNI was in the opportunity section if it exceeded half of the previous calculation; otherwise, it was in the threat section.

Table 5 shows how the technological factor presents a chance to build academic administration around the idea of developing skills for a green economy. It demonstrates how technology is being developed and applied in school academic administration, which will benefit students' learning in new ways through a range of technological media and fortify academic administration in terms of content management, methodical learning data collection, and an efficient system for quick and ongoing evaluation of student learning. However, socio-cultural, economic, and political and policy factors are threats. This is an indication of the absence of involvement in civic society. There is a failure to recognize the importance of teaching kids about the environment and providing them with the skills they need to succeed in the green economy and the changing, environmentally conscious labor market of the future. One such issue influencing school administration is the government's ambiguous position regarding the growth of environmental education.

On the other hand, one useful instrument for promoting sustainable environmental development is environmental education. Schools ought to offer stakeholders the chance to engage in instruction related to environmental development and the growth of skills for the green economy. This will foster the development of not just green attitudes and values but also green behaviors in students. However, societal trends must also be altered so that more ecologically friendly labor is valued.

Strategy Development

After reviewing the draft strategy in the focus group discussion, the experts concluded that it was appropriate and feasible. They also offered comments and suggestions on how to create the complete strategy as follows: (1) Adjust keywords in the sub-strategies of the main strategy to reflect logical progression, urgent requirements, and well-defined approaches to mitigate weaknesses; (2) Review some procedures that are still unclear; and (3) Arrange the strategies clearly so that readers can understand them easily and can put them into practice step by step. Table 6 displays all of the strategy improvement findings.

Table 6 presents the academic administration strategy management, which consists of three main strategies and six sub-strategies, based on the concept of skills development for a green economy by using the SWOT matrix.

The first strategy consists of two sub-strategies that have been developed to be consistent in practice; that is, administrators must recognize the importance of and create a shared vision for school personnel to be environmentally friendly. Subsequently, educators should collaborate to create a curriculum that prepares students with the knowledge and abilities needed to succeed in the green economy.

According to the second strategy, the goal of teaching and learning should be to help students become independent learners. In order to emphasize learning through practice, teachers should plan integrated teaching and learning through academics and extracurricular activities. Students' experiences and participation in activities that push them to employ higher-order thinking skills will provide them with the knowledge that they need.

The third strategy calls for administrators to prioritize assessment and measurement. Administrators should support educators in utilizing a range of evaluation methods and evaluating them based on authentic assessments, which can reveal a student's actual practical abilities.

Table 6 Strategies for secondary school academic management based on the concept of skills development for a green economy

Strategy	Sub-strategy
1) Establish educational institutions in order to improve the Green Environment Curriculum.	1.1) Increase the goal of an integrated program by concentrating on three skills based on developing skills for the student's green economy.
	1.2) Develop an integrated school curriculum that is aligned with the aims and learning outcomes to build students' skills for the green economy by focusing on three skills.
2) Improve the standard of teaching and learning to develop students' skills for the green economy.	2.1) Transform the development of learning outcome-driven learning management strategies to create capabilities, with an emphasis on three strengths for the green economy of the student.
	2.2) Design comprehensive teaching and extracurricular experiences for the classroom to strengthen student competencies for the green economy based on three skills.
3) Modify the evaluation and appraisal of student learning capabilities for the green economy.	3.1) Develop a framework and guidance for evaluating and measuring student learning abilities for the green economy, highlighting three fields of skills with practical, all-round tests that reflect the skills of individual students.
	3.2) Create and develop criteria and tools used to assess and examine results that align with learning experiences to build students' expertise, with an emphasis on three skills for the green economy.

Conclusion and Recommendations

The findings of this study indicate that development of skills for the green economy—skills that will be essential in the future labor market—is not given sufficient consideration in existing educational strategies. In particular, the measurement and evaluation category with the highest requirements values shows that schools continue to mainly depend on exams to assess learning, and that they do not plan learning sufficiently effective activities for students. In order to develop the true abilities of the students, school administrators should support instructors in planning lessons and extracurricular activities that provide students with the chance to practice the skills they need. These activities should also be evaluated based on authentic assessments.

Strategies of secondary school academic management based on the concept of skills development for a green economy have been developed, covering operations in the areas of curriculum development, teaching and learning, and measurement and evaluation. By putting the strategies into practice, students will be able to acquire the skills they need for success in their future careers. Nonetheless, in order for teachers to take environmental education and student skills development seriously, schools need to create a shared vision.

Limitations of the Research

This academic administration research focuses on the operational conditions surrounding curriculum administration, curriculum implementation, assessment, and evaluation—both inside the classroom and through assembly, clubs, or other activities. The concepts of green skills and skills for green jobs proposed by Her Majesty's Government (2011), Martinez-Fernandez et al. (2010), DEFRA (2008 as cited in Cedefop, 2010), Strietska-Ilina et al. (2011), and Pavlova and Huang (2013) are the sources of the idea of skills for a green economy. The construction of the strategic plan then focuses mostly on creating tactics that address weaknesses.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Promoting youth civic engagement using a multi-sector partnership approach: A case study of provincial Thailand

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Abstract

Youth civic engagement (YCE) is a positive development method for fostering skill sets and social mindsets among young people. Previous research has indicated that supporting YCE requires multisector cooperation to create a youth development ecosystem. However, little is known of how to effectively manage such an ecosystem, specifically, in terms of identifying a lead organization and understanding its role. This study addresses a significant gap in the literature by examining collaborative models, mechanisms, and processes of YCE and synthesizing a YCE model. It used a case study design and took a qualitative research approach. In all, 60 participants were selected, including youths, government officials, representatives of nongovernmental organizations, members of local administration associations, community leaders, and parents through purposive sampling methods. Data were collected from project reports, participatory observation, in-depth interviews, and focus group discussions and were analyzed using thematic analysis. A systematic model to support YCE consists of both social and learning processes. The social process involves supporting and actualizing youth learning experiences. The lead organization fulfills three main functions: (1) engagement management, (2) capital management, and (3) knowledge management. Furthermore, the learning processes aimed at supporting youth experiences include studying community issues, creating community development projects, and reflecting on the learning experience. The results of this research indicate changing perspectives on supporting youth development from one-off activities to the connectivity of all sectors to jointly develop youth in a systematic fashion. It helps the policy sector formulate youth development policies valuing all provincial-level participants.

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Introduction

Study of youth development has seen a shift from addressing risk behavior problems to promoting positive youth development (Larson, 2000; Lerner et al., 2005; Parker, 2009; Rich, 2003). Youth civic engagement (YCE) is considered a positive method of youth development because it includes activities that allow youths to express their public-spirited commitment to fostering social conscience, such as in volunteering work, learning through community service, community management, social movements, youth councils, and media production. Participating in such activities confers the capacity to cultivate a community-oriented mindset (Barnason et al., 2022; Chan et al., 2014; Dolan & Brennan, 2016; Zaff et al., 2008).

Democratic regimes that promote individual and societal rights, freedom, and justice support youth development as part of overall social development. Three factors significantly impact these youth citizenship approaches: (1) ecological assets include people, family, community, civil society, organizations and social networks; (2) youth's strength: the unique characteristics of young people aiming to reach their full potential; and (3) procedures for positive youth development (Lerner et al., 2014). Ideally, environmental development would incorporate varied stakeholders in the youth development ecosystem (Benson, 2007; Benson et al., 2011; Flanagan & Levien, 2010).

This corresponds to previous research indicating that the factors associated with YCE include available capital in the social ecosystem, notably the educational system (Torney-Purta, 2002), participation in peer and school activities (Niemi & Junn, 1998), inclusion in youth development programs (Larson, 2000); involvement in community service projects (Walker, 2002), and the political commitment and participation shown by the family (Canavan et al., 2016). Factors involving social capital, culture, and social context are also included (Zaff et al., 2008), but the way that these factors operate remains unresolved, as is who is to handle management mechanisms and how interactions among these factors affect youth civic engagement.

Previous research on YCE explores its positive impacts on youth development, and while studies have examined aspects of societal support mechanisms, they primarily relied on theoretical frameworks (Coleman, 2021; McGregor & Dolan, 2021). However, empirical evidence from case studies remains lacking. Consequently, there is insufficient visibility into actual collaborations between organizations and stakeholders at the local level, including limited examination of management mechanisms, learning processes, and influence dynamics (Li, 2020).

This current study addresses the identified gap by focusing on model development through case studies. These case studies offer valuable insights into the roles, components, management mechanisms, and evolution of collaborative efforts among relevant sectors. The findings of this research will inform policy recommendations and provide valuable lessons for academic work related to YCE.

The objective of this study is (1) to examine collaborative models, mechanisms, and processes of youth civic engagement (YCE) within multisector partnerships in provincial Thailand, and (2) to synthesize a comprehensive YCE model based on insights gained from three case studies.

Literature Review

Multisector Partnership

To address the aforementioned knowledge gap in supporting youth civic engagement (YCE), a clear mechanism is required. This study utilizes the concept of multisector partnerships to elucidate this mechanism. Multisector partnerships gather individuals and organizations from various sectors of the community to collaborate on innovative projects or policy changes. Cooperation within these partnerships involves uniting local, community, provincial, and/or national residents to create systemic change (Backer & Norman, 2000). Partnerships may be temporary or permanent, formally or informally structured, and involve nonprofit organizations, communities, foundations, public or private funds, policy agencies, businesses, educational institutions, and professionals.

Previous research on multisector partnerships for the promotion of YCE highlights the importance of collaboration across sectors to create inclusive and sustainable opportunities. These partnerships leverage the resources and expertise of each sector to develop effective youth development programs, build social capital, promote participatory democracy, empower young people, and promote social justice (Bustos, 2020; Cooper, 2005; Perkins et al., 2001). Conditions necessary for successful youth development processes within multisector partnerships include learning and capacity-building processes, meeting platforms or social activities to motivate collaboration, effective communication channels, leadership recognition

of the process's significance, and mutual awareness of issues between stakeholders.

Multisector partnership approaches provide opportunities for stakeholders to increase involvement by collecting empirical data collectively before using data to establish youth development plans. By establishing collaboration at the initial stage, these approaches enable joint efforts in youth development. (Chantaramanee et al., 2012; Chantatueng, 2011; Kaewtima, 2012; Suwanngam, 2015; Thitachote, 2014).

YCE in Thailand

YCE has seen progress throughout Thailand, influenced by the National Child and Youth Development Promotion Act, B.E. 2560 (Department of Child and Youth Affairs, Ministry of Social Development and Human Security, 2017), which empowered youth councils. However, challenges persist in youth development due to the fragmented approach and ingrained mindset among stakeholders (Benson, 2007).

Reviewing youth development policies and processes in Thailand reveals efforts to unify national development for children and youth with provincial and local initiatives. Despite the implementation of plans and monitoring by relevant sectors (National Child and Youth Development Promotion Committee, (2018); Office of the National Youth Promotion and Coordination Committee, Office of the Prime Minister, 1987), challenges remain. The involvement of government, private, and civil society sectors in macro-level implementation has been intensive. However, a lack of coordination and common goals has hindered progress (Ayutthaya, 1971). Furthermore, unclear operating structures and inefficient information systems have limited the effectiveness of public relations efforts and staff competence (Department of child and youth affairs, Ministry of Social Development and Human Security, 2017).

Theoretical Framework

Ecology studies systems of organisms interacting with one another in natural environments. Ecological theory has been adopted by developmental psychologists to explore human development from a contextual or environmental perspective. Research in this area (April et al., 2023; Bronfenbrenner, 1992; Gal, 2017) finds that socio-ecological system relationships involve a four-layered system of microsystems, mesosystems, exosystems, and macrosystems. Ecological systems theory (EST) provides a framework to examine individual existence and relationships across diverse spaces, ranging from the individual to his or her environment, including family, workplace, and society (Bronfenbrenner, 1992; Duerden & Witt, 2010).

This research adopted EST to explore YCE by identifying individuals and organizations involved in youth development at the provincial level in Thailand, enumerating division levels, and analyzing their role in youth development, as well as the models and mechanisms used to organize the collaboration of a range of organizations and stakeholders, developing multisector partnerships.

Methodology

This qualitative study was conducted using a case study research (CSR) design with multiple case studies, involving the in-depth analysis of several cases to obtain a comprehensive understanding of the phenomenon.

Recruitment and Sampling

This study focuses on Thailand, as it has recently begun developing policies for YCE. However, in most provinces of the country, these initiatives are typically being carried out only by government agencies. The researchers were interested in learning how a transition from state-run programs to multisector partnerships can be achieved. The cases were selected using purposive sampling, favoring those that seemed likeliest to provide meaningful data (Patton, 2015).

For this study, 3 out of the 76 provinces in Thailand were chosen as data sources. This selection was based on the fact that youth development in Thailand functions at a policy level down to the provincial and local levels. The researchers established criteria for selecting provinces with complete data based on several factors, including organizational structure, management mechanisms, and lead organizations to gain a clearer understanding of the phenomena under study. Additionally, these selected provinces have a background mindset in YCE, holding that youth development should involve collaborative effort among various government agencies and align with ecological theories that require related organizations to function at both the macro- and the exosystem levels.

Three case studies were examined: (1) Samut Songkhram Province Community-based Research Center (NGO); (2) Nonthaburi Provincial Social Development and Human Security Office; and (3) Ubon Ratchathani University in Ubon Ratchathani Province.

Participants

The criteria for participant selection were as follows: (1) the lead organization staff had at least 3 years of experience supporting youth development work; (2) all internal and external stakeholders had experience of working with or in the lead organization to support YCE of at least 1 year, including (2.1) those who attended meetings and seminars and participated in YCE upon request as well as (2.2) those participating in implementing YCE by offering resources, knowledge, and other related opportunities; and (2.3) those for which behavioral or attitudinal changes were produced following interacting with children or youth; (3) representatives from government and the private sector, CSOs, and the community had decision-making authority and involvement in support of provincial YCE; (4) workers with children and youth groups were at least 18 years old, having participated in lead organization activities and conducted public projects or activities for at least 1 year; and (5) participants were willing to provide data.

A target study population was duly selected from case studies across three provinces in 60 samples, including 29 from Ubon Ratchathani, 19 from Samut Songkhram, and 12 from Nonthaburi, all internal and external provincial stakeholders. The participants were divided into eight groups: (1) 8 lead organization staff members; (2) 12 community and local leaders; (3) 4 instructors at educational institutions; (4) 6 family members, including parents and guardians; (5) 6 local government officials involved in public health, educational, community, and social development; (6) 5 external parties, including supporting leaders and NGO staff; (7) 1 external party involved as policy-making agency representatives; and (8) 18 members of youth group.

Data Collection

Data collection in this study followed the principles of CSR, implementing multiple research methods over the course of various time periods to attain a more profound understanding of the subject (Denzin, 2006). Four primary methods of data collection were utilized: (1) project report analysis; (2) periodic participant observation of YCE activities by the lead organization, building collaboration with involved provincial stakeholders, and implementation of youth group activity; (3) in-depth, face-to-face interviews with 35 participants; and (4) group discussions with 25 participants.

The research employed a set of guiding questions for both in-depth interviews and focus group discussions. These questions were developed based on the research objectives. Validity was addressed through consultation with three experts, who reviewed the questions to confirm their alignment with the research objectives. Triangulation of data from interviews, focus groups, and observations further strengthened the credibility of the findings.

Data Analysis

Interview transcripts were analyzed using thematic analysis, with the identification and exploration of cross-thematic patterns and themes (Braun & Clarke, 2012). Thematic analysis can provide a structured approach to uncover insights, patterns, and relationships within qualitative data to contribute to model development through the identification of YCE from multisector partnerships with new concepts.

The analysis was conducted with the following predetermined tentative themes: (1) organizations and people involved in provincial youth development; (2) level of collaboration in multisector partnerships; (3) organizations' roles in youth development; (4) models and mechanisms for organizing the collaboration of different organizations and stakeholders; and (5) multisector partnership development manner, allowing new themes to emerge inductively. The data were coded, collated, and sorted into themes using Microsoft Excel, with each sheet representing one theme. Themes and subthemes were devised, refined, combined, divided, and discarded.

The models were reviewed in consultation with professionals and experts including a youth, a youth worker, an academic, a policy maker, and an executive of youth funder, who provided feedback for the improvements and adjustments to holistically meet current youth development contexts for application to all provincial contexts.

Ethical Considerations

This research received ethical approval from the Committee for Research Ethics (Social Sciences), Faculty of Social Sciences and Humanities, Mahidol University. Informed consent was obtained, and participant confidentiality was ensured through anonymized data. The study posed minimal risk, with participants free to withdraw or skip any questions if they felt uncomfortable. All steps were taken to protect participants and minimize harm.

Results

Case Study 1: Samut Songkhram Province

The study found that YCE in Samut Songkhram Province also employs a multi-sector partnership approach through two processes:

Social process

The Samut Songkhram Province Community-based Research Center, a civil society organization, serves as the lead organization, facilitating networking among stakeholders for policy formulation and youth development. Mechanisms include; (1) Provincial policy-level committee mechanism (Macro System): Connects various government agencies, with the lead organization participating as a committee member; (2) Learning and capacity development mechanism (Exosystem): Supports goal-setting, planning, knowledge exchange, and evaluation to promote YCE; and (3) Local researcher network mechanism (Exosystem): Provides a platform for local researchers and community leaders to exchange knowledge and develop youth civic consciousness through local community learning. One sample, an NGO staff member, stated:

> *"We aim to establish a youth network based on an area-based approach, using learning and knowledge as bridges to connect various youth issues."*
>
> (A male nongovernmental organization staff member, March 28, 2018)

Learning process

The focus is on enabling youth to study and analyze community problems, develop local development projects with adult collaboration, and foster a sense of local belonging. A strong mentorship system supports reflection on self and community improvement.

Case Study 2: Nonthaburi Province

The study identified two processes for YCE in Nonthaburi Province using a multi-sector partnership approach:

Social process

Nonthaburi Provincial Social Development and Human Security Office, a government agency, serves as the lead organization, primarily supporting youth councils at the provincial and local levels under the National Child and Youth Development Promotion Act. Mechanisms include: (1) Provincial-level operating mechanism (Exosystem): Operates through government agencies, focusing on organizing youth councils, providing financial support, and overseeing activities; And (2) Youth and Child Network Coordination Center (Exosystem): Connects various local and external stakeholders, including civil society, academia, and private sectors, to support youth development initiatives. One sample, a government official, noted the following:

> *"The Youth and Child Network Coordination Center acts as a backup for youth councils, providing a space for mentoring and integrating youth with local government agencies."*
>
> (A male government official, May 15, 2018)

Learning process

The youth councils engage in project-based activities to develop their capacities but lack a structured mentorship system for pre- and post-project learning and reflection.

Case Study 3: Ubon Ratchathani Province

The study found that the YCE using a multi-sector partnership approach in Ubon Ratchathani Province operates through two main processes:

Social process

Ubon Ratchathani University serves as the lead organization, driving youth policy and connecting various stakeholders within the province to form a youth development mechanism. Five mechanisms were identified (1) Policy committee mechanism (Macro System): Develops youth and child policies and plans; (2) Provincial operational mechanism (Exosystem): Supports budget allocation and capacity building for local youth councils; (3) Learning and capacity development mechanism (Exosystem): An informal network involving local NGOs that facilitates youth capacity-building; (4) Academic mechanism (Exosystem): Led by university faculty, collecting data on the local youth situation to advise policy formulation; and (5) Local youth development mechanism (Microsystem): Involves community leaders, local government officials, educators, parents, and local administrative staff, supporting youth groups. One informant, a university lecturer, stated:

> *"In the past, youth development work had to restart every time there was a change in the provincial governor. This taught us the lesson that*

we need a youth development plan supported by a mechanism so that we do not have to start over each time. There should be a provincial policy-level committee mechanism, a strong academic mechanism, a continuous local youth development mechanism, and a specifically designed youth coaching mechanism, so that these mechanisms can strengthen youth development efforts in the community."

(A male university lecturer, April 23, 2018)

Learning process

Ubon Ratchathani University supports youth councils in engaging in self-improvement activities and community development through experiential learning, where youth actively participate and reflect on their experiences.

Multisector Partnership Model for Youth Civic Engagement

According to the research findings, the model of the YCE process from the multisector partnership at the provincial level has three components. Figure 1 illustrates the key components of the multi-sector partnership approach. These components, including the roles of various stakeholders and the mechanisms of collaboration, are presented as follows:

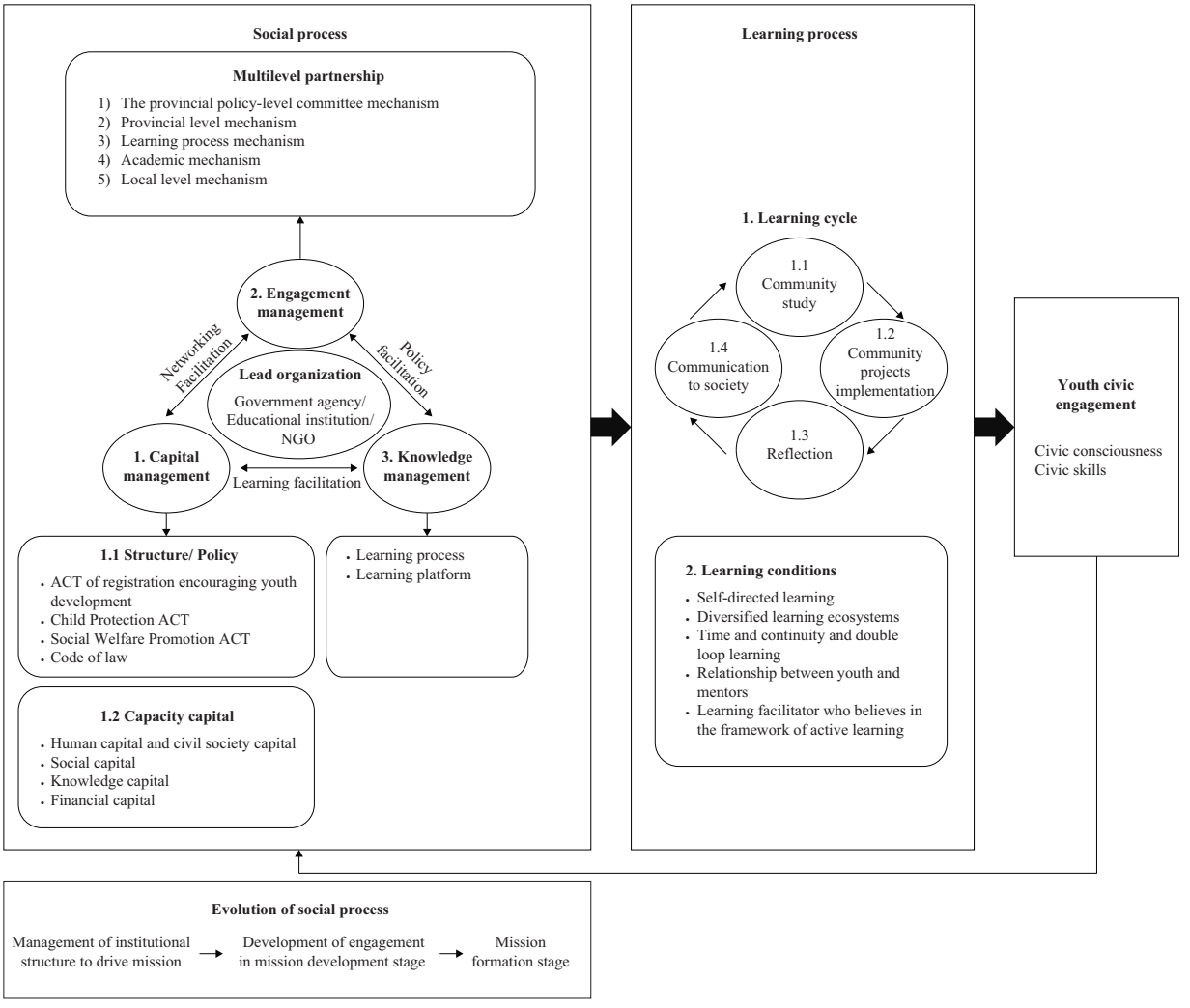

Figure 1 Multisector partnership model for youth civic engagement

Social process

The social process involves managing capital, engagement, and the knowledge of the lead organization that is actively participating in youth development. Local collaborative networks are essential for youth development initiatives, particularly within the context of a holistic paradigm adopted by the lead organization, which values the interconnections among stakeholders. Therefore, mechanisms are initiated at different levels of collaborative youth development, forming mechanisms to establish the engagement and participation of involved stakeholders; manage capital capacity in diverse regional fields; and guide learning and knowledge among stakeholders at different levels to establish engagement and the exchange of knowledge regarding youth development.

The multi-sector partnership approach is crucial in Thailand for fostering YCE by integrating efforts from various stakeholders, including government agencies, educational institutions, and civil society organizations. This collaborative approach allows for pooling resources and expertise, which is necessary for addressing the diverse needs of youth development in the country. In Thailand, initiatives such as the National Child and Youth Development Promotion Act emphasize the importance of multiple sectors working together to create a supportive environment for youth (Department of Child and Youth Affairs, Ministry of Social Development and Human Security, 2017).

Lead organization mechanism

This is a structural mechanism for a government agency, nongovernmental organization, educational institution, or any other lead organization. Lead organizations must serve as central coordinators, facilitating points among diverse agents to establish support systems of youth development. This is achieved by focusing on participation in terms of knowledge exchange, learning processes, and mutual management of youth development work. One informant, a university lecturer, stated:

> *"As the lead organization, our four mechanisms focused on policy, research, community engagement, and database management. For policy, we pursued municipal laws at the subdistrict level to support children and youth. These mechanisms filled gaps in government efforts where no agency had previously taken comprehensive responsibility."*
>
> (A male university lecturer, April 23, 2018)

The role of the lead organization in managing the social process enabled the establishment of provincial youth development support structures with diverse stakeholder groups at diverse levels. The findings from case studies of youth development implementation yielded a summary of mechanisms at different levels, as well as identifying their roles in YCE:

1. Provincial policy-level committee mechanism

This youth development ecosystem incorporates all stakeholders, including the government, the private sector, civil society, social development funds, and educational institutions. Those who are involved at this level share views on adhering to location-based initiatives that promote holistic approaches with the inputs from all stakeholders to gather resources while monitoring and evaluating outcomes. Resource sharing was also required, both regarding knowledge and financial and human capital in local youth development; the lead organization was the central agency that linked policy committee mechanisms and other mechanisms at different levels. One sample, a government official, noted the following:

> *"For children and youth, we utilize the Child Protection Fund, the Social Welfare Fund, and the Social Welfare Promotion Committee, chaired by the governor. We meet twice a year to discuss these issues. Previously, there were no opportunities for collaboration among children and youth groups. After engaging with the Samut Songkhram community-based research center, we established a mechanism for mutual recognition, where NGOs, public sector groups, or any supportive group can become partners. Money isn't the key factor; it's the willingness to collaborate and use these mechanisms that make partnership possible."*
>
> (A female government official, April 26, 2018)

2. Provincial-level operating mechanism

This is a provincial-level operating mechanism in the youth development ecosystem, consisting of government officials, including the Provincial Social Development and Human Security Office, and the Provincial Child and Youth Council. Both are essential for managing the budget for subdistrict youth council implementation under local administrations. For the capacity development of staff members and the Child and Youth Council working group, the provincial council acts as a mentor to ensure that projects are planned and executed according to plan and that the results are summarized. The provincial council offers directions for strategic policies about children and youth. One informant, a university lecturer, reported the following:

"Provincial collaborative mechanisms rely on the Social Development and Human Security Office to connect with the governor and coordinate government stakeholders. Provincial child and youth committees take on policy responsibilities by holding meetings, monitoring projects, and coordinating with 60 partner agencies. These meetings cover successful and unsuccessful projects, databases, research, and fieldwork, which provide essential data for provincial policy-making."

(A male university lecturer, April 23, 2018)

3. Learning and capacity development mechanism

This mechanism, based on provincial networks for youth development, is formed using individuals who are interested in the organization of regional learning: government officials, representatives of NGOs, and former youth leaders. These groups play an active role as learning-based directors who design processes for the development of subdistrict youth capacity; such as providing community study instruments, planning for project proposal development, monitoring operations, and/or offering learning summaries following each activity. One respondent, a community-based researcher, noted:

"Participating in research forums and provincial meetings allows us to share experiences and observe diverse youth development challenges, processes, and mentoring approaches across different areas. If we lack experience with certain issues, we learn from others' insights."

(A female community-based researcher, April 13, 2018)

4. Academic mechanism

This consists of university lecturers and/or independent scholars who have expertise in diverse areas supporting academics who work in youth development systems, making youth development recommendations. One informant, a university lecturer, observed the following:

"The university's mission includes producing graduates, conducting research, providing academic services, and fostering art and cultural heritage. As part of its academic service, the university supports other sectors by offering comprehensive knowledge across various fields, including youth civic engagement, and making youth development recommendations at the policy level."

(A male university lecturer, April 23, 2018)

5. Local youth development mechanism

This community-level mechanism involves micro-level participants in the ecosystem including community leaders, administrators, local administration organizational staff, teachers, educators, parents, youth mentors, and youth leaders. All of these stakeholders can participate in developing a system to support youth development through holding periodic meetings to establish a working group mechanism (such as a core team) for the development of policies to support youth development through relevant budget-support ordinances, resources, locations, and projects, improving the learning process through the monitoring of measures and the facilitating of learning before, during, and after youth self-development programs. One informant, a government official, asserted:

"The advancement of the YCE mechanism this time focuses on two levels of collaboration: provincial and subdistrict. At the subdistrict level, the key mechanisms are having mentors and administrators who understand and create opportunities for youth participation. Ultimately, we hope to see local ordinances at the subdistrict level that mandate support for children and youth, including funding, workspaces, and projects that interest them. Youth mentors should play the role of communicators to clarify the goals and processes of youth development so that parents and community leaders can adjust their mindsets and participate in youth development."

(A female government official, April 26, 2018)

Evolution of social processes

Youth development work has been structurally evolving into a multisector YCE partnership that continuously sustains self-management across three stages: mission formulation, mechanism development to enable mission formulation engagement, and the establishment of a mission-motivational institutional structure.

The three-stage evolution of the structure of youth development enabled the transfer of a YCE framework and methodology from lead organizations to community mentors. These include executives and organizational staff of local administrations, as well as educational institutions. This increased the number of change agents who can enhance the capacity of youth development. Youth leaders who succeed in this learning process have raised the bar and become change agents returning to work on social development in their communities

and enabling YCE dynamism and adaptivity through feedback loops. This evolutionary cycle formed the foundation for change agents to become human capital in the ecosystem themselves as a condition for the social management process to progress to the next phase.

The Learning Process

A key principle for the YCE learning process model is the certainty that this process can encourage young people to follow out self-directed learning until civic characteristics emerge and methods of thinking and behaviors transform. In this process, youths have independently rediscovered their potential and community roots as well as civic qualities. The learning process gradually upholds the ideology of citizenship, incorporating love for the community, functioning until behaviors change through active learning to create knowledge and skills that reflect experiences, focusing on the content, processes, and inherent value of actions until awareness transforms community membership.

There are four main steps in executing a learning process: (1) community study, including gathering information and learning about local issues; (2) implementing community projects through the advancement of community development projects and implementation; (3) reviewing and reflecting on the learning experience; and (4) societal communication to create a learning process with the community and society. This continuous learning cycle develops YCE, enabling youths to become good citizens with specific characteristics. There is a sense of belonging to the learning process, a diverse learning ecosystem including actual community learning resources for community members to use as they face actual problems in the form of finding learning time and continuity, and interactions between youth and mentors in a safe space or environment where they are listened to, and learning experiences are valued. A learning facilitator who believes in a hands-on learning framework and in designing experiential learning step-by-step is armed with thought-provoking questions to encourage youth to think and reflect. This leads to perceptional transformations in action and redefines the learning experience. One sample, an NGO staff member, commented as follows:

> *"The learning process is designed around field visits and community learning, such as understanding the Mae Klong River's environment. Youths explore upstream and downstream areas to learn how activities affect water quality and how locals live by the river and sea. Real experiences like these create lasting memories...Reflection is critical for summarizing lessons learned and evaluating outcomes. Throughout the project, especially during the learning festival, participants reflect on their experiences, learn from mistakes, and recognize successes in addressing past errors."*
>
> (A male nongovernmental organization staff member, March 28, 2018)

Youth Citizenship Characteristics

Youth development involves using the above model to allow youth to develop YCE across two dimensions: civic consciousness and civic skills.

Civic consciousness

This recognition of self-worth with respect to the public and society consists of individual consciousness that is connected with the community that is inhabited, together with appreciation and love for it and the recognition of its value and capital through the creation of a sense of ownership of local wisdom and public assets and resources. In addition, the sense of responsibility to themselves and their families that is developed includes recognizing community and societal rights, taking responsibility, and the value of participating in challenges.

Civic skills

The external characteristic of civic skills reflects the ability to act with citizenship consciousness. Their key elements include having systematic thinking skills, information, knowledge, and understanding the mechanisms and interrelationships of the local environment and the communities inhabited, their civic problems and mechanisms causing such problems, as well as how they are multidimensionally connected to the social ecosystem. These skills enable the creation, planning, and conducting of problem-solving activities in civic responsibility while connecting with peers and adults in community development group activities.

Discussion

The multi-sector partnership approach is crucial in Thailand for fostering YCE by integrating efforts from various stakeholders, including government agencies, educational institutions, and civil society organizations.

This collaborative approach allows for pooling resources and expertise, which is necessary for addressing the diverse needs of youth development in the country. In Thailand, initiatives such as the National Child and Youth Development Promotion Act emphasize the importance of multiple sectors working together to create a supportive environment for youth (Department of Child and Youth Affairs, Ministry of Social Development and Human Security, 2017).

It was found that elements of multisector stakeholders are involved in the process of youth development at various levels, including actors in government agencies, educational institutions, CSOs, and subdistrict entities, as well as in villages that are administered by local administrative organizations and by the development workforce from nongovernmental organizations that encourage youth development work. These elements include (1) policy-level committee mechanisms, (2) provincial mechanisms, (3) learning mechanisms, (4) academic mechanisms, and (5) local youth development mechanisms, consisting of stakeholders who are involved in the youth development ecosystem as the smallest individual units, such as community leaders, administrators and staff members of local administrative organizations, administrators and teachers in educational institutions, parents, youth mentors, and youth leaders. These people directly impact YCE. However, this study did not find clear evidence on the role of families or guardians in creating learning for youth. Nevertheless, the family and parents may originate learning for youth, as implied in research about youth development with civic identity beginning from the family (Jennings & Niemi, 1974).

The elements of stakeholders involved in diverse youth development procedures at different levels of the youth development ecosystem can be understood through the theory of Bronfenbrenner (1992), examining individual development as it occurs through interaction with the physical environment, in association with diverse environments. In a social ecosystem, a networked and interconnected relationship interacts socially with diverse stakeholders, both directly and indirectly. The system may be divided into five levels: (1) microsystem, (2) mesosystem, (3) exosystem, (4) macrosystem, and (5) chronosystem. This corresponds to previous research (Duerden & Witt, 2010) showing that the progress of the civic identity of youth is a process of direct and indirect interaction between individuals and their environment.

These mechanisms involve relationships among multisector stakeholders in youth development ecosystems for diverse stakeholder groups who have varied macro (macrosystems) and provincial-level (exosystems) youth development roles that are not directly related to youth. However, there is interaction that occurs between change agent leaders (mesosystems) in learning about mindsets and methods for youth development by collaboratively determining resource vision, mission, and mobilization, as well as engagement in managing youth development according to the roles played at different supra-community levels. The microsystem is directly related to youth mentorship, linking community adults and supporting the learning process (mesosystems). Stakeholders at each level of the provincial youth development ecosystem must depend on each other (interdependence) while interacting in the learning system and self-organizing to create youth development work and self-improvement until it reaches the state of being a sustainable system.

Previous research has indicated that social support plays a role in the development of YCE (Dolan, 2022). In addition, it has explored the management of local organizations in promoting YCE and the role of organizations in shaping policies for YCE development, as well as fostering collaboration among relevant entities (Li, 2020). Key factors that promote YCE include social support and the development of social capital, as noted by Dolan & Brennan (2016). These factors are strengthened through partnerships that provide opportunities for youth to engage in community service, mentoring, and leadership programs, all of which are integral to building civic responsibility and long-term engagement. However, robust examples from studies showcasing the collaboration of various sectors at different levels in YCE development are still lacking. This study identified models, roles, and collaboration among different sectors that can be utilized to promote cooperation among the relevant organizations in the advancement of YCE.

Other key YCE processes were established due to the roles played by the lead organization, which was not evident in the theoretical framework of previous research studies (Coleman, 2021; Lerner et al., 2014; Li, 2020; McGregor & Dolan, 2021). Government agencies alone may not effectively manage provincial youth development through a top-down approach; coordination with other leading provincial-level agencies is essential. In Thailand, these agencies include NGOs, educational institutions, government agencies in collaboration with the Youth and Child Network Coordination Center, along with leading provincial youth groups that have development experience. As a result, lead organizations that have diversified organizational characteristics differentiate individual and organizational relationships within the connected network.

Regardless of the form that the lead organization takes in each province, its key roles should be understood in a three-pronged relationship system: (1) facilitating networking by acting as a medium to connect those involved and coordinating mechanisms at all levels to participate in planning and implementation while sharing knowledge and benefiting from collaboration; (2) facilitating local policy formulation through the provision of a platform for participants in determining the vision, goals, and mission of youth development as well as by fundraising resources to support the work through formal and informal provincial committee mechanisms while planning and implementing them; and (3) facilitating the learning process for cross-group stakeholders in establishing networking processes through interactions and exchanges of philosophy while supporting youth development work in a context of mutual learning.

This study underscores the lessons learned in developing YCE from the stakeholders involved in this development. These lessons can be valuable for shaping youth development policies prioritizing collaboration among all relevant sectors. Such collaboration can maximize the benefits of YCE for young people, contributing to building a body of knowledge in youth development shifting the perspective from segmented development to a more holistic and integrated approach.

This research possesses strengths from synthesizing a comprehensive YCE model based on insights gained from three distinct case studies of YCE development. The case study data clearly illustrate the role of leading agencies in facilitating connections with multisector partnerships, providing new knowledge for youth development initiatives. However, further validation of the YCE model would enhance the completeness of this research. It remains to be determined how the capabilities of lead organizations can be developed to effectively fulfill this role.

Conclusion and Recommendations

This study explored collaborative models, mechanisms, and processes of YCE from multisector partnerships to synthesize a YCE model in provincial Thailand. It used a case study design and a qualitative research approach. The results of the research indicated changing perspectives on the support provided to youth development from relying on one-off activities to connecting all sectors and jointly developing youth systematically.

This study demonstrates that all three provincial case studies share key principles in terms of YCE social and learning processes. Both are interconnected through lead organizations in a key mechanism ensuring progress and continuity in the youth development ecosystem by participation in managing capital, stakeholder relationships, and learning platforms.

The findings suggest that government agencies involved in provincial youth development should clearly define the roles of lead organizations and encourage participation through providing opportunities for agencies and staff with knowledge and experience in youth development to engage with the system. This would heighten system diversity and self-management, altering the youth development paradigm at systematic and operational levels.

The research findings in this study differ from those of previous studies, as this study involves the development of a YCE model using a case studies approach. This approach emphasizes transforming the youth development perspective, moving away from a sole reliance on the actions of government agencies and the formulation of youth development policies. It highlights the importance of the involvement of actors from all relevant sectors. This model demonstrates the potential for the YCE development at the provincial or local government level through the participation of stakeholders from various sectors, a concept that could be adapted and applied in the context of other countries. Further research should be conducted to develop a YCE process model involving multisector subdistrict partnerships and enhancing the role of the family unit in YCE.

Conflict of Interest

The authors declare that there is no conflict of interest.

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The effect of transparency on learning organizations mediated by knowledge sharing

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Abstract

Developing a learning organization in an elementary school setting in Indonesia necessitates a comprehensive approach that includes cultivating a culture of continuous learning, collaboration, and creativity among teachers, students, and administrators. One critical facet of this is improving elementary school teachers' instructional skills. This study sought to evaluate the impact of transparency and information sharing on learning organizations. The research participants were 242 elementary school teachers in West Java, Indonesia, who were surveyed online. Structural Equation Modeling Partial Least Square (SEM-PLS) was involved to test the data collected and the proposed model. The results show that transparency and knowledge sharing have a direct effect on the learning organization. This study also notes the indirect effect of transparency on the learning organization through knowledge sharing. The main point of this study is that the learning organization can be predicted by transparency and knowledge sharing. The study also notes that the teaching competence of elementary school teachers in Indonesia can be improved through a learning organization.

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Introduction

Teachers are always required to work professionally and have a learning culture to improve the quality of education. To improve teachers' professional quality, the learning organizations (LO) of teachers should be strengthened (Marthuis, 2020). Studies related to the positive impact of learning organization in educational institutions have attracted the interest of scholars in various parts of the world (Habtoor et al., 2020; Nazarova et al., 2021). Additionally, schools are required to develop an organizational culture (Shamir-Balderman, 2021)

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that incorporates cultural values for a continuous learning process based on adequate information transparency (Argyris & Schön, 1996) and develop knowledge-sharing (KS) behavior between teachers (Cheng et al., 2023; Li et al., 2023).

Transparency refers to the openness, clarity, and accessibility of information within an organization (Rong et al., 2021). Transparency builds trust among employees, reduces uncertainty, and aligns individual and organizational goals (Liu et al., 2022). Research by Liu et al. (2022) examined how transparency in information and open communication contribute to the development of a learning organization. Their findings suggest that when organizations are transparent, employees are more likely to share information freely, which is critical for organizational learning. Furthermore, knowledge sharing is a process where employees exchange information, skills and expertise (Zeinabadi, 2022). Implementing systems and structures that facilitate knowledge sharing, such as collaboration tools, knowledge management systems, and cross-functional teams, can help bridge the gap between transparency and organizational learning (Azeem et al., 2021; Singh et al., 2021). Knowledge sharing plays a vital role in the development and sustainability of learning organizations (Akram et al., 2020; Al-Kurdi et al., 2020; Nguyen et al., 2019). The effectiveness of an LO largely depends on how well knowledge is disseminated and utilized within the organization (Arsawan et al., 2022; Lee & Choi, 2003; Singh et al., 2021). In the relationship between transparency and learning organizations, knowledge sharing acts as a mediator. This means transparency leads to increased knowledge sharing, which in turn fosters a learning organization (Gagné et al., 2019).

Studies related to transparency, learning organization, and knowledge sharing in education have indeed been conducted in various parts of the world (Kim et al., 2017; Lee & Li, 2021), including Indonesia (Anggraini, 2001; Khoyrudin et al., 2020). However, there are still few studies that reveal the effect of transparency on learning organization mediated by knowledge sharing, especially in elementary schools (Zahedipour et al., 2022). Most studies are taking a stance to involve learning organizations to enhance employee performance in a company instead of educational institutions (Rumijati, 2020; Tesavrita & Suryadi, 2016). In addition, the focus of the study in the Indonesian context tends to be unique because, as a developed country, it still has problems with the institutional capacity of schools, especially in elementary schools.

Therefore, this study aims to fill the gap in knowledge of the relationship between transparency, knowledge sharing, and learning organization in the context of elementary school teachers in Indonesia. Thus, whether transparency promotes knowledge sharing and learning organization arises. Does knowledge sharing mediate the relationship between transparency and learning organization? This research offers new insights in three ways. First, it adds to the theory of the effect of transparency and KS on learning organization, which scholars still seldom examine. Second, this research offers practical solutions for stakeholders to improve the professional competence of teachers. Third, it offers new insights for the Indonesian government to improve institutional organization in elementary schools.

Methodology

Research Design

The study used a quantitative approach with a cross-sectional survey method. The research describes exogenous and endogenous variables. The exogenous variables in this study are transparency and knowledge sharing. The endogenous variable is the learning organization. In this study, LO refers to Senge et al. (2012), which covers a continuous process within an organization that provides smooth learning, maintains continuous transformation, and empowers teachers' performance. The rationale for the proposed model is grounded in a robust theoretical and empirical framework. Transparency, as an organizational trait, directly fosters the creation of learning organizations by promoting trust, open communication, and collaboration. Additionally, its role in facilitating knowledge sharing further enhances its impact of transparency on learning organizations. By understanding these relationships, this study aims to provide valuable insights into how educational institutions can develop into learning organizations that continually adapt and evolve, thus improving teacher competence and student outcomes. The research framework in this study is provided in Figure 1.

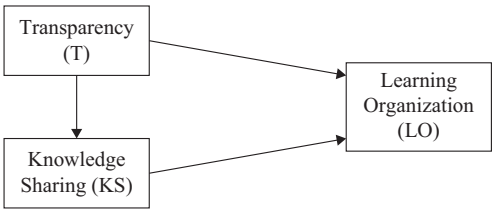

Figure 1 The conceptual framework
Source: own elaboration based on Schnackenberg et al. (2021); Senge et al. (2012); Yi (2009)

Sample and Data Collection

The participants of this study were elementary school teachers throughout West Java, Indonesia, who are members of the Learning Teacher Community (LTC). LTC refers to an organizational forum for elementary school teachers that has coaching and development activities and exchanging information to improve the quality of learning. The reason for selecting respondents was that the LTC organization was formed in the COVID-19 era as a breakthrough in finding learning solutions that were carried out through online meeting forums. Data collection techniques were carried out through Google Forms surveys and distributed via WhatsApp to respondents. The teachers were asked to assess the situation they felt or experienced. We used the non-probability purposive sampling technique developed by Hair et al. (2020) to select participants. Participants filled out a total of 312 questionnaires, and after being validated, 242 questionnaires were filled out entirely so that they could be analyzed further. This research was conducted from June to August 2021. Participation was voluntary, and we protected confidentiality and anonymity. The Faculty of Economics Universitas Negeri Jakarta Indonesia obtained the ethical code.

Instrument Development and Data Analysis

Questionnaire items, in the form of a scale, are compiled based on relevant theories and studies of each variable. We adapted three items from Senge et al. (2012) to test the variable learning organization. The three items were adapted from Schnackenberg et al. (2021) to test the transparency variable. Finally, we adapted three items from Yi (2009) to test the Knowledge-Sharing variable. We developed the indicator in nine questions. Thus, a total of 27 questions. We measured participants' reactions using a five-point scale developed by Likert (1932) where (1) was "strongly disagree" and "strongly agree" (5).

Structural Equation Modelling Partial Least Squares (SEM-PLS) with Smart PLS software tool (version 3.0) was involved to understand the relationship between variables. The suitability of the variable model of transparency, knowledge sharing, and learner organization model was evaluated by following the procedure developed by Hair et al. (2020), namely: (1) checking composite reliability, which must be higher than 0.7; (2) comparing the outer loading value and cross-loading; (3) checking convergent validity at the Average Variance Extracted (AVE) value limit which is not less than 0.5; (4) evaluating discriminant validity with the Fornell-Larcker criterion by comparing the square root value of AVE and the value of the relationship between the other constructs; and (5) assessing the structural model by considering Variable Importance in the Projection (VIP). This study's recommended values for collinearity issues are between 0.20 and 5. After all of them meet the assessment criteria, structural equation modeling is carried out to estimate the hypothesis with a significant level of 5 percent.

Results

Demographic Analysis

The participants of this study are provided in Table 1. In general, the respondents in this research are teachers between the ages of 31 and 40 years. Most of them have working experience in the range of 11–20 years, and a small percentage have working experience of more than 31 years. Lastly, elementary teachers in this study are university graduates.

Table 1 Respondent demographic information

S/No.	Characteristic	Frequency	Percent
Age	< 30 years	79	31.10
	31–40 years	130	51.18
	> 41 years	45	17.71
Sex	Man	117	46.06
	Woman	137	53.93
Working experience	< 10 years	68	26.77
	11–20 years	122	48.03
	21–30 years	43	16.92
	> 31 years	21	8.26
Education	Bachelor degree	231	90.94
	Master	23	9.05

Sources: Authors (2024)

This study aims to examine the effect of transparency (T) and knowledge sharing (KS) on learning organization (LO). Table 2 is the result of descriptive statistics for each variable, which includes the mean and standard deviation. Table 2 informs that the Learning Team is the average measurement indicator with the highest value (4.278 out of 5). The lowest score is Personal Skills (3.501 out of 5).

Table 2 Descriptive statistics

Variable	The mean (Standard Deviation) of the indicators		
	1	2	3
Learning Organization (LO)	3.48 (0.65)	3.78 (.516)	3.88 (0.52)
Personal skills	3.47 (0.66)	3.50 (0.82)	-
Learning Team	3.53 (0.64)	4.27 (0.53)	-
Systems Thinking	3.96 (0.61)	3.77 (0.68)	-
Transparency (T)	3.70 (0.73)	3.51 (0.88)	3.63 (0.86)
Disclosure	3.77 (0.73)	3.73 (0.94)	3.51 (0.92)
Clarity	3.51 (0.92)	3.50 (1.05)	-
Accuracy	3.60 (0.98)	3.63 (0.98)	3.65 (1.03)
Knowledge Sharing (KS)	3.96 (0.63)	3.56 (0.85)	3.89 (0.76)
Knowledge Reception	4.05 (0.77)	3.84 (0.80)	-
Knowledge Store	3.543 (0.84)	3.60 (1.01)	-
Knowledge transfer	3.99 (0.88)	3.80 (0.85)	-

Note: The number for the mean (*M*) of an indicator is not in parentheses, the number for the standard deviation (*SD*) of an indicator is in parentheses

Table 3 summarizes the results of the measurement (Outer) Model. Based on Table 2, it is known that all LO, T, and KS indicators have loading factors in the range of 0.681 to 0.927. However, a knowledge-sharing variable with the KS1 indicator (0.61) must be lowered. Since the loading factor is between 0.40 and 0.70, as revealed by Hair et al. (2020), deletion does not increase measure above the reflective threshold. The indicator is maintained. Furthermore, in this study, it is known that the AVE value of the variable ranges from 0.55 to 0.78 (> 0.50), which has implications for achieving discriminant validity. The CR and Cronbach's Alpha (α) values for the variable T are 0.91 and 0.86, KS are 0.78 and 0.59, and LO is 0.85 and 0.74, respectively. Referring to the opinion of Hair et al. (2020), the true reliability usually lies between Cronbach's alpha (representing the lower bound) and the composite reliability (representing the upper bound). This result implies that the variable achieves composite reliability. This study followed the model of Chin (1998) and Hair et al. (2020) for discriminant validity. The discriminant validity test applies the Fornell-Larcker criteria, where all the square roots of the AVE value for the variables are T (0.78), KS (0.55), and LO (0.66). The complete results of the measurement (outer) model can be seen in Table 3.

Structural Model

The next step is to evaluate the structural model. Hair et al. (2020) recommend that research conducted must follow a procedure that includes five stages, namely: (1) collinearity testing, (2) path coefficient test, (3) R-square level test (R^2), (4) testing effect size (f^2), and (5) test the relevant predictions (Q^2).

Collinearity Test

To find out whether collinearity occurs, such is known from the Variance Inflation Factor (VIF) coefficient, which has a VIF value lower than 5.00 (Hair et al., 2020). From the calculation of the value of the VIF coefficient, it is known that the value ranges from 1.083–3.004, and all of them are less than 5.00, which means there is collinearity, and all indicators of the tested constructs are valid.

Table 3 Results of measurement (outer) model

Variable	Indicator	Loading	C.R.	α	AVE
Transparency (T)	Disclosure	0.88	0.91	0.86	0.78
	Clarity	0.92			
	Accuracy	0.85			
Knowledge Sharing (KS)	Knowledge Reception	0.61	0.78	0.59	0.55
	Knowledge Store	0.81			
	Knowledge transfer	0.78			
Learning Organization (LO)	Personal skills	0.84	0.85	0.74	0.66
	Learning team	0.87			
	Systems thinking	0.72			

Sources: Authors (2024)

R-Square (R^2)

R-square (R^2) aims to test whether or not each endogenous variable has predictive power in the model. It follows three categories: 0.75, 0.50, and 0.25 for substantial, moderate, and weak. From the results of the R^2 test, the KS variable has an R^2 value of 0.091, which means that the transparency variable can explain 9.1 percent of the knowledge-sharing variance with a weak predictive rate. In addition, the R^2 LO value is 0.213, which means that 21.3 percent of the learning organization variance can be explained by transparency and knowledge sharing with a weak predictive rate.

F-Square (F^2)

The effect size test (f2) aims to determine how much influence the size of the predictor variable has on the structural model (Hair et al., 2020). For test effect size (f2), the rule of thumb used refers to Hair et al. (2020), where the values of 0.02, 0.15, and 0.35 indicate the effect of small, medium, and large sizes. Our test results show that the f2 value of the variable T on KS is 0.100, which indicates a small effect size. Furthermore, the effect of T and KS on LO is 0.147, which means it has a negligible effect size.

Table 4 informs the decomposition effect where: (1) the direct effect of the T variable is significant on LO ($\beta_{direct} = 0.35$, $p < .00$), (2) the direct effect of KS also on LO ($\beta_{direct} = 0.20$, $p < .00$), (3) the direct effect of T is significant on KS ($\beta_{direct} = 0.302$, $p < .001$), and (4) the indirect effect of T on LO through KS is also significant ($\beta_{indirect} = 0.062$, $p < .01$), so the total effect is also significant ($\beta_{total} = 0.419$, $p < .00$).

Discussion

This study aims to examine the effect of transparency and knowledge sharing on learning organization. The results of our study answered all the proposed hypotheses. First, transparency affects the learning organization. Our study's results strengthen Kurland et al.'s (2010) findings, which state that the visionary leadership factor determines the learning organization (LO). This visionary leadership supports the growth of LO by developing learning infrastructure, learning culture, and conditions for the growth of information transparency to build collaboration, creativity, innovation, and organizational productivity (Habtoor et al., 2020; Nazarova et al., 2021). In line with Garvin (1993), Jamali et al. (2019) and Nazarova et al. (2021), a strategy was found for how to build LO, which focuses on aspects of knowledge transparency in organizations. The results of Garvin (1993) also found that transparency is significant and fundamental to building a trust culture between organizations and individuals, which has implications for the realization of stability and unity in all areas of the organization. Transparency prioritizes the value of "openness and honesty", which impacts the development of an open, trusted, creative leadership system that has an impact on productivity, creativity, performance, and organizational success (Meraku, 2017). The results of this study are very logical because a learning organization is built on a foundation of transparency. In the Indonesian context, transparency is a significant predictor of the growth and development of LO.

Second, the results of our study found that knowledge sharing (KS) affects LO. The results of our study strengthen several previous studies (Asrar-ul-Haq & Anwar, 2016; Liao & Wu, 2010; Rahmatullah & Mahmood, 2013; Wang et al., 2014), which found a significant effect of KS on LO. As an organization that develops and encourages its members to learn (Prasetya, 2017), KS contributes positively to the level of activeness and commitment of organizational members (Allen & Meyer, 1990) and is also related to organizational support for learning and knowledge sharing behavior (Allen & Meyer, 1990; Yang et al., 2020). The results of this study also strengthen the findings of Phang et al. (2017), where with a higher KS culture, the competence, skills, and experience of its members increase significantly and affect the performance of organizational members.

Table 4 Decomposition effect

Independent variable	Dependent variable					
	Knowledge Sharing			Learning Organization		
	β_{direct}	CI	*p*-value	β_{direct}	CI	*p*-value
T	0.30	[0.19-0.41]	0.00	0.35	[0.25-0.45]	0.00
KS	-	-	-	0.20	[0.09-0.31]	0.00
R^2	0.09	-	-	0.21	-	-

Note: CI= confidence interval, β_{direct} = direct effect. Effects were calculated via bootstrapping procedure (with bias-corrected standard errors) using 5000 random draws

The results of this study are logical, considering that KS is needed by the organization so that information is distributed evenly so that all members have information that can be used to advance the organization. In the context of educational organizations, KS is essential to minimize gaps in teacher knowledge and competence. Recognizing the weaknesses or shortcomings experienced before and during the Pandemic, it is necessary to strengthen elementary schools as an organization (learning organization). The development of elementary schools as learning organizations is expected to be able to move individuals in the organization to continuously learn and improve their abilities, and to be ready to face all forms of change and manage them well. Consequently, elementary schools must be able to develop a learning culture within the organization (Shamir-Balderman, 2021), which can develop cultural values that support the learning process.

As an effective and functional LO, Elementary Schools are required to have (1) relevant information, (2) supporting infrastructure, (3) technology, (4) relevant policies, and (5) be able to mobilize community participation in education (Sæbø et al., 2008). Furthermore, elementary schools are required to be able to improve (1) public trust and public participation in school administration, (3) enriching the public's insight and knowledge about elementary schools, and (4) minimizing violations of applicable regulations. Therefore, school information's transparency level can be measured by several indicators, namely: (1) availability of document information, (2) clarity and completeness of the information, (3) process openness, and (4) a regulatory framework ensuring transparency (Kristiansen & Pratikno, 2006).

Third, our study found that transparency (T) affects knowledge KS directly and significantly. Our study reinforces previous findings (Iqbal et al., 2015; Mura et al., 2016), which stated the effect of T on KS. The study by Lee and Li (2021) on 449 employees about how the effect of information transparency in the organization shows that information transparency has a positive effect on job satisfaction and the level of employee trust in the organization, more so in an era of crisis, information or communication transparency robustly affects organizational effectiveness. Moreover, transparency is a must in the era of the pandemic crisis (Fairbanks et al., 2007), especially regarding information on health crises (Yang et al., 2015).

Finally, our study found the effect of transparency (T) on learning organization (LO) mediated by KS. The results of our study strengthen the findings (Appel-Meulenbroek et.al, 2018; Iqbal et al., 2015). The rationale is that systemically, KS behavior as an asset of individual behavior involving sharing one's work-related knowledge and expertise with other members (Appel-Meulenbroek et al., 2018) has a significant effect on the effectiveness of the learning organization. The availability of knowledge flow strengthens systems organizational culture and conditions the achievement of organizational goals, increasing human resources (Hameed et al, 2019). Several studies have found three types of knowledge that need to be shared to strengthen the learning system (Alexander et al., 1994; Appel-Meulenbroek et al., 2018; Hameed et al., 2019). First, explicit knowledge is an external source of knowledge that is easily articulated, written, stored, accessed, and shared or communicated (Alexander et al., 1994; Appel-Meulenbroek et al., 2018). Data that are processed and readily communicated is an example of explicit knowledge. Second, implicit knowledge is the practical application of explicit knowledge, such as best practices and skills transferred from job to job. Implicit knowledge is also tacit knowledge hidden in the human mind that is difficult to access. Third, tacit knowledge is in the form of accumulated personal experience. Unlike explicit and implicit knowledge, tacit knowledge tends to be challenging to write, articulate, and present in a tangible form (Lee & Li, 2021; Nonaka, 1994).

Conclusion

This study aims to examine the effect of transparency and knowledge-sharing behavior on learning organizations. The results showed that transparency and knowledge sharing had a significant effect on organizational learning. Furthermore, knowledge sharing mediates the effect of transparency on knowledge sharing. This research offers elementary schools and the government the opportunity to carry out transparency and cultivate knowledge sharing in building learning organizations as an effort to increase the teaching competence of robust teachers in various conditions. This study contributes to the model developed by Schnackenberg et al. (2021); Senge et al. (2012) and Yi (2009) by adding new insights into the effect of transparency and KS on learning organizations, especially in elementary schools.

Our study also offers strategies for the Indonesian government primarily in solving problems in the institutional capacity of primary schools. In more detail, to strengthen a learning organization, awareness is needed that LO is a professional necessity. The higher teachers' level of awareness as members, the more motivated they are to be actively involved in organizational activities.

Furthermore, to create a strong learning organization that can respond to every situation, the government needs to facilitate the strengthening of learning organizations in elementary schools by creating an information transparency system and knowledge-sharing behavior. Lastly, increasing information transparency can be done by strengthening clear, complete, accurate, relevant, and accessible information. This program is expected to strengthen awareness and active participation in the realization of the learning organization program that is being rolled out. Equally important, strengthening knowledge-sharing behavior can be done by; (1) encouraging and developing a conducive learning culture; (2) providing space, time, and facilities for knowledge-sharing; and (3) strengthening visionary leadership that positions knowledge and processes as strategic aspects.

The practical implications of these findings for elementary schools and educational policymakers are that the study highlights the importance of transparency in fostering learning organizations in elementary schools. It suggests that transparency fosters a culture of openness, allowing teachers, parents, and students to access information about policies, decisions, and performance. Policymakers should create guidelines for transparency in school management, such as sharing school performance data and budget allocation. Knowledge sharing among teachers is crucial for developing learning organizations, and educational authorities should promote professional learning communities. Schools should also integrate learning organization characteristics like systems thinking, personal mastery, and team learning into their operations. Policymakers should offer frameworks and tools to help schools implement these practices.

Limitations

This research has several limitations. It was conducted quantitatively using a questionnaire as a research instrument and only attempts to collect broad and not in-depth information. The research was also conducted only on 242 elementary school teachers in West Java province, Indonesia. Therefore, this research cannot be generalized to all elementary school teachers throughout Indonesia. However, the results of this research can be used to provide an overview of the impact of transparency and knowledge sharing on the learning organization of elementary school teachers in the West Java province of Indonesia. This research is entirely based on elementary school teachers as research respondents.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Validation of students blended learning course experience in Thai medical education

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Abstract

Blended learning is a widely used method in education to promote active learning and enhance students' learning outcomes. Therefore, evaluating the quality of blended learning courses requires an effective model for benchmarking, which can improve student satisfaction and is crucial for quality assurance in higher education. This study aimed to validate and examine student's blended learning course experience in Thai medical education using a quantitative research design. A total of 560 medical students from a large medical school in Thailand participated. Data analysis was conducted using Confirmatory Factor Analysis (CFA). The findings indicate that components and indicators were: (1) general skills with six indicators, (2) online sessions with five indicators, (3) clear goals and standards with four indicators, (4) good teaching with six indicators, (5) appropriate assessment with four indicators, and (6) appropriate workload with three indicators. The second order CFA demonstrated that the student blended learning course experience model had an acceptable fit with χ^2 (249) = 1.148, p = .056, RMSEA = .016, RMR = .005, SRMR = .05, GFI = .995, AGFI = .995, NFI = .961, and CFI = .995. These findings could contribute to the development of guidelines for designing a medicine bachelor's degree curriculum that incorporates blended learning methods.

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Introduction

The dynamic field of medicine demands a dynamic approach to education, equipping future healthcare professionals with the knowledge, skills, and adaptability to navigate a complex and constantly changing landscape. Blended learning, a pedagogical strategy that merges traditional classroom instruction with online learning activities, has emerged as a powerful instrument in this endeavor (Wong et al., 2020). This approach offers several advantages over traditional methods, such as increased access to learning materials, accommodation of different learning styles, and potential improvement in critical thinking skills through interactive online components (Jebraeily et al., 2020; Luo et al., 2017; Makhdoom et al., 2013; Vallée et al., 2020; Westerlaken et al., 2019). Consequently, most higher education institutions have designed curricula based on a blended learning approach (Alammary et al., 2014; Mirriahi et al., 2015).

Quality teaching has become one of the most influential concepts in higher education. Governments have closely scrutinized the quality of teaching and learning in higher education institutions, focusing on undergraduate students' perceptions of teaching quality and learning experiences in many countries, including the US, the UK, and Australia (Andrew, 2010; Asonitou et al., 2018; Yin & Ke, 2017). Thailand's higher education system has implemented quality assurance mechanisms over the past decade to shift the focus from quantity expansion to quality enhancement. In 2015, the Ministry of Higher Education, Science, Research, and Innovation in Thailand initiated a five-year cycle for evaluating the quality of undergraduate teaching. The most standard criteria for educational quality assurance emphasize the reality of teaching practices, students' outcomes, and learning experiences. Within this context, evaluating the effectiveness of blended learning has become a critical area of focus (Ellis et al., 2016).

An evaluation of blended learning experiences and quality models are needed. Ginns and Ellis (2009) promoted the idea of e-learning in the blended learning experience of university students, creating a reliable questionnaire called "The Student Course Experience." This study used a large sample size method, which affects precision and replicability (Asonitou et al., 2018; Kassab et al., 2015; Kyriazos, 2018; Vo et al., 2020). In the context of Thailand, the medical education curriculum stands out as particularly challenging, complex, and practice-focused. Previous studies have found that students in different departments or contexts had different perceptions of their learning context (Andrew, 2010; Barattucci & Zuffo, 2012; Fryer et al., 2012; Ramsden, 1991). Confirmatory Factor Analysis (CFA), a popular and reliable method, confirms the performance of an assessment within a specific context.

This study focuses on validating core issues and examining the consistency between the students' course experience in blended learning within Thailand's medical curriculum and empirical data. The goal is to ensure quality and address challenges with a blended learning approach. This could involve pilot testing with students, conducting a CFA to ensure items measure intended constructs, and assessing internal consistency and reliability. The outcome of this study would contribute to social science by preparing educators to gain valuable insights into the effectiveness of their program design and student behavior in blended learning, identify areas for improvement, and prepare for quality assurance that will lead future medical professionals to success.

Literature Review

Theoretical Background

Blended learning, or hybrid learning, is a pedagogical approach that combines traditional face-to-face instruction with online activities (Makhdoom et al., 2013; Mubayrik, 2018). It incorporates various learning theories, including social learning theory, adult learning theory, and constructivism theory. Social learning theory suggests that learning occurs through observation, interaction, and mutual learning. Online forums and collaborative activities foster peer-to-peer learning and knowledge exchange, while face-to-face sessions provide opportunities for interaction with instructors and peers (Bandura & Walters, 1977; Devi et al., 2017; Makhdoom et al., 2013). Adult learning theory emphasizes self-directed learning, active participation, and the real-world application of knowledge (Makhdoom et al., 2013; McKenna et al., 2020). Blended learning allows students to learn at their own pace and explore topics independently (Jethro et al., 2012; May et al., 2009), while face-to-face sessions facilitate discussion, collaboration, and the application of knowledge in practice scenarios (Knowles et al., 2014; Makhdoom et al., 2013).

Based on constructivism theory, blended learning (Cheung & Hew, 2011; Cronje, 2020; Makhdoom et al., 2013; Westerlaken et al., 2019) encourages students to actively construct and apply their knowledge by engaging with various learning materials and interacting with teachers and peers. Online resources present foundational concepts, facilitate communication, and support inquiry and discovery learning, while face-to-face sessions encourage students to challenge assumptions through collaboration and discussion, building upon their existing knowledge base for problem-solving (Cheung & Hew, 2011; Vygotsky, 1987).

The Blended Learning Environments in Medical Education

Blended learning is a pedagogical approach that combines online learning modules with traditional face-to-face instruction, revolutionizing medical education (Crawford & Jenkins, 2018; Medina, 2018). It offers numerous benefits, including increased access to learning materials, catering to diverse learning styles, and fostering crucial skills for lifelong learning. Online modules, often asynchronous and accessible anytime and anywhere, provide greater flexibility and control over the learning pace, allowing students with demanding clinical rotations or varied learning styles to explore topics at their convenience and revisit challenging concepts as needed (Chhetri, 2017; Shahabadi & Uplane, 2015; Westerlaken et al., 2019).

Blended learning goes beyond content delivery; actively engages students in the learning process through interactive online activities, simulations, and digital case studies. These activities stimulate critical thinking and problem-solving abilities, which are vital for navigating complex medical scenarios. Online forums and collaborative learning tools foster dialogue and knowledge exchange among students, replicating the collaborative nature of future practice (Hou, 2011; Nortvig et al., 2018).

The online component of blended learning often requires independent exploration of resources and completion of activities, fostering the development of essential self-directed learning skills (Akgunduz & Akinoglu, 2016; Geng et al., 2019). These skills are vital for future healthcare professionals to remain lifelong learners in a rapidly evolving field (Ilic et al., 2015; Rowe et al., 2012). Designing a successful blended learning program requires meticulous planning, selecting appropriate online resources, ensuring seamless integration between online and offline components, and training instructors to facilitate interactive and engaging sessions (Dangwal, 2017; Nortvig et al., 2018).

In conclusion, blended learning offers a transformative approach to medical education, empowering future healthcare professionals to navigate the complexities of the medical field and adapt to continuous advancements throughout their careers. By addressing potential challenges and continuously refining best practices, blended learning holds the potential to shape the future of medical education.

Assessing the Quality of Blended Learning through Students' Course Experiences

The Student Course Experience (SCE) is a widely used instrument for assessing student experiences and feedback on teaching quality in higher education (Westerlaken et al., 2019; Yin & Ke, 2017). It has evolved from the course perceptions questionnaire developed at a British university by Ramsden (1979) and has been applied across 3,372 institutions from 13 Australian higher education institutions, making it multidisciplinary. The instrument has been revised to accommodate current students and address concerns about its psychometric functioning (Wilson et al., 1997).

Specifically, the SCE is designed for blended learning, measuring student satisfaction with online resources, face-to-face session facilitation, teaching performance, and the learning environment (Ginns & Ellis, 2009). It is a reliable instrument for assessing the blended learning environment. Validation through confirmatory factor analysis involving 3,602 students from 16 higher education faculties showed Cronbach's alpha values indicating internal consistency between 0.71 and 0.83. The instrument consists of 28 indicators with a six-factor structure, including good teaching, clear goals and standards, assessment, workload, e-learning or online components, and general skills. Previous studies have used the SCEQ as their basis, including those by (Ali & Mohd Dodeen, 2021; Andrew, 2010; Asonitou et al., 2018; Chakrabarty et al., 2016).

Methodology

This study employed a quantitative survey method to validate students' blended learning course experiences in Thai medical education. It involved medical undergraduate students in their 2nd–6th year of

the Doctor of Medicine curriculum who utilized e-learning or online sessions to supplement their face-to-face curriculum at a large medical school in Thailand.

Participants

The study analyzed data from medical undergraduate students (2nd–6th year) enrolled in a Doctor of Medicine program, a bachelor's degree program that used e-learning and online sessions to support the face-to-face curriculum at a large Thai medical school. The population consisted of 1,398 medical students, with a minimum sample size of 280 participants. The study followed Kyriazos' (2018) recommendations for CFA, ensuring a sample size at least 10:1 greater than the number of observed variables (n = 28). The sample selection method involved random sampling, first selecting participants via quota sampling techniques according to year levels (2nd–6th year), representing 30 percent of the students per year level. Subsequently, convenience sampling techniques were used. Freshmen were excluded due to their lack of course experience.

Data Collection

The study aimed to improve and develop scale items for data collection by converting the SCE based on Ginns & Ellis (2009), into a Thai version. For verification, three translators forward-translated the items to Thai, and then two translators back-translated them into English.

We implemented the following measures to evaluate the content's validity and reliability in the Thai version: (1) The content validity and reliability of the scale was verified by five university professors specializing in Medical Education, Foreign Language, Education Technology, Educational Assessment, and Psychological Measurement. The IOC values ranged from 0.60 to 1.00, with a cut-off value of .50 (Turner & Carlson, 2003); and (2) A trial run was conducted to assess the Cronbach's alpha coefficient of the scale, yielding a value of .95.

The scale consisted of two parts. The first part included three questions regarding demographic characteristics, such as gender, year level, and cumulative Grade Point Average (GPAx). The second part included six components covering 28 indicators, using five-point Likert scales to measure medical students' perception of their course experience in the blended learning program. An example question was, "The e-Learning systems and online sessions of medical teachers helped in learning in my Doctor of Medicine program." The measure was publicized, and medical student volunteers were invited to participate through posters.

Before conducting the survey, the research ethics committee of the author's institution formally examined and approved the scale and research procedures. Medical students were invited to participate voluntarily, and data collection was conducted over one month in September 2020. All survey results were collected electronically and encrypted for analysis.

Data Analysis

This study analyzed data from 560 respondents (42.26%) who completed the research scale using licensed SPSS version 26 for descriptive analysis, corrected-item-total correlation, ANOVA, and correlation coefficient analysis. The internal consistency of the scale was assessed for reliability, yielding a Cronbach's alpha coefficient of .817 for the entire scale. The six components had Cronbach's alpha coefficients of .866, .755, .750, .760, .888, and .881, respectively.

Construct validity was investigated using ANOVA to analyze mean differences between known student groups, and the correlation coefficient was obtained to ascertain criterion validity. Confirmatory factor analyses were used to extract components and validate consistency between indicators and components using licensed AMOS. The study followed fit indices and criteria for evaluating CFA model, including $\chi^2/df \leq 3.00$, $p > .05$, RMSEA ≤ .08, RMR ≤ .05, SRMR ≤ .05, GFI ≥ .90, AGFI ≥ .90, NFI > .95, and CFI ≥ .95 (Hair et al., 2019).

Results

Participants

The study involved 560 medical students enrolled in a blended learning program within the medical curriculum. The majority were male (n = 324, 57.7%). The distribution by education level was as follows: 4th year (n = 146, 26.6%), 2nd year (n = 135, 24.1%), 5th year (n = 132, 23.6%), 3rd year (n = 80, 14.3%) and 6th year (n = 64, 11.4%). In terms of GPAx, most participants had a GPAx between 3.50–4.00 (n = 300, 54.1%), 3.00–3.49 (n = 225, 40.2%), 2.50–2.99 (n = 29, 5.2%), and 2.00–2.49 (n = 3, 5.0%).

Descriptive Results

According to Table 1, most participants performed at a median level in terms of good teaching, clear goals and standards, appropriate assessment, appropriate workload, online sessions, and general skills. The mean for each variable was greater than 3.40 out of a maximum of 5. The results of the correlation analysis between variables showed no significant differences across various demographic variables (gender, year level, and GPAx). These demographic variables did not meet the preliminary agreement for the ANOVA analysis. We also obtained the correlation coefficient to confirm the validity of the criteria.

In addition, we obtained the correlation coefficient to confirm the validity of the criteria. Bartlett's test of sphericity revealed that the six components (latent variables) were statistically significant at the .05 level, indicating relationships between the variables studied. Additionally, when testing the appropriateness of the variables used in CFA, the Kaiser-Meyer-Olkin (KMO) was .818, with the measure of sampling adequacy (MSA) ranging from .787 to .838, all exceeding the .50 threshold (Hair et al., 2019).

According to Table 2, each of the six components underwent validation using a measurement model. All components passed the criteria, indicating that all measurement models could be entered into the first order of CFA.

Considering factor loading (β) as shown in Table 3 and Figure 1, it was found that the standardized coefficients of the 28 indicators were positive, ranging from .219 to .823, and statistically significant at the .05 level. It can be concluded that the first order of CFA confirmed that the students' blended learning course experience model in the Thai medical education had a reasonable fit with $\chi^2/df = 1.145$, $p = .059$, RMSEA = .016, RMR = .005, SRMR = .053, GFI = .995, AGFI = .995, NFI = .962, and CFI = .995.

Table 1 Descriptive, construct reliability and correlation of model

n = 560

Factor	1	2	3	4	5	6	7	8	9
Gender	1	0.08	0	-0.06	-0.09*	-0.06	0.03	0.01	-0.05
Year		1	0.02	-0.04	-0.03	0.03	0.08	0.06	0.01
GPAx			1	0.07	-0.14**	0.07	0.14**	0.02	0.13**
GT				1	0.52**	0.33**	0.17**	0.46**	0.48**
CG					1	0.41**	0.28**	0.47**	0.46**
AA						1	.41**	0.37**	0.36**
AW							1	0.32**	0.31**
OS								1	0.60**
GS									1
M	1.42	1.52	2.84	3.94	3.82	3.80	3.44	3.88	3.90
SD	0.49	0.62	1.33	0.60	0.61	0.65	0.67	0.72	0.58
Bartlett's test = 954.022, $p < .01$, KMO = .818, MSA between .787–.838									

Note: M = mean, *SD* = standard deviation, Gender (male = 1, female = 2), Year level (a 2nd year = 1, a 3rd year = 2, a 4th year = 3, a 5th year, a 6th year = 6), GPAx (3.50–4.00 = 1, 3.00–3.49 = 2, 2.50–2.99 = 3, 2.00–2.49 = 4).
*$p < .05$, ** $p < .01$.

Table 2 Measure model of the students' blended learning course experience in Thai medical education

Components and number of indicators	β Ranges	*SE* Ranges	R^2	Qualified criteria
Good teaching (GT: 6 indicators)	0.620–0.808	0.047–0.056	0.384–0.654	$\chi^2/df = 1.535$, $p = .175$, RMSEA = .031, RMR = .008, SRMR = .013, GFI = .995, AGFI = .981, NFI = .995, CFI = 998.
Clear goals and standards (CG: 4 indicators)	0.208–0.863	0.057–0.061	0.043–0.745	$\chi^2/df = .317$, $p = .728$, RMSEA = .001, RMR = .001, SRMR = .007, GFI = 1.000, AGFI = .981, NFI = .998, CFI = 1.000.
Appropriate assessment (AA: 3 indicators)	0.315–1.00	0.035–0.037	0.099–1.00	$\chi^2/df = .004$, $p = .951$, RMSEA = .036, RMR = .001, SRMR = .006, GFI = 1.000, AGFI = .98, NFI = 1.000, CFI = 1.000.
Appropriate workload (AW: 4 indicators)	0.150–0.855	.050 –.058	0.022–0.732	$\chi^2/df = .885$, $p = .413$, RMSEA = .000, RMR = .008, SRMR = .009, GFI = .998, AGFI = .992, NFI = .996, CFI = 1.000.
Online sessions (OS 5 indicators)	0.691–0.822	0.044–0.051	0.477–0.676	$\chi^2/df = 1.375$, $p = .248$, RMSEA = .026, RMR = .007, SRMR = .01, GFI = .997, AGFI = .986, NFI = .997, CFI = .999.
General skills (GS: 6 indicators)	0.695–0.815	0.483–0.664	0.483–0.664	$\chi^2/df = 1.496$, $p = .163$, RMSEA = .030, RMR = .007, SRMR = .014, GFI = .994, AGFI = .981, NFI = .993, CFI = .998.

Table 3 Second-order of CFA of the students' blended learning course experience in Thai medical education

Components	Manifest	β	*b*	*SE*	CR	R^2	Order
1. Good teaching	Q1	.712	.781	.049	15.981***	.509	4
	Q2	.798	.893	.051	17.612***	.474	1
	Q3	.776	1.000	<->	<->	.679	2
	Q4	.657	.702	.048	14.658***	.464	5
	Q5	.737	.861	.053	16.110***	.509	3
	Q6	.647	.765	.049	15.584***	.568	6
2. Clear goals and standards	Q7	.699	.896	.072	12.520***	.575	3
	Q8	.698	.949	.074	12.800***	.656	2
	Q9	.783	1.000	<->	<->	.696	1
	Q10	.219	.334	.071	4.733***	.569	4
3. Appropriate assessment	Q11	.683	1.000	<->	<->	.462	1
	Q12	.681	.921	.083	11.064***	.278	2
	Q13	.438	.595	.072	8.261***	.033	3
4. Appropriate workload	Q14	.766	.972	.071	13.606***	.677	2
	Q15	.823	1.000	<->	<->	.586	1
	Q16	.183	.235	.059	4.010***	.192	4
	Q17	.527	.681	.061	11.103***	.464	3
5. Online sessions	Q18	.680	.750	.044	17.062***	.466	5
	Q19	.754	.927	.048	19.146***	.048	4
	Q20	.834	1.000	<->	<->	.613	1
	Q21	.810	.936	.045	20.938***	.487	2
	Q22	.758	.903	.047	19.347***	.489	3
6. General skills	Q23	.754	.918	.051	17.930***	.419	2
	Q24	.713	.893	.052	17.303***	.543	3
	Q25	.681	.891	.048	18.542***	.432	5
	Q26	.824	1.000	<->	<->	.603	1
	Q27	.688	.834	.051	16.470***	.636	4
	Q28	.714	.881	.051	17.317***	.507	3
Second order confirmatory factor analysis							
General skills		.865	.825	.062	<->	.748	1
Online sessions		.829	1.000	<->	<->	.687	2
Clear goals and standards		.664	.691	.064	<->	.441	3
Good teaching		.628	.687	.063	<->	.395	4
Appropriate assessment		.572	.569	.065	<->	.327	5
Appropriate workload		.273	.333	.064	<->	.074	6
χ^2/df = 1.148, p = .056, RMSEA = .016, RMR = .005, SRMR = .05, GFI = .995, AGFI = .995, NFI = .961, and CFI = .995.							

Note: *** $p < .001$, two-tailed.

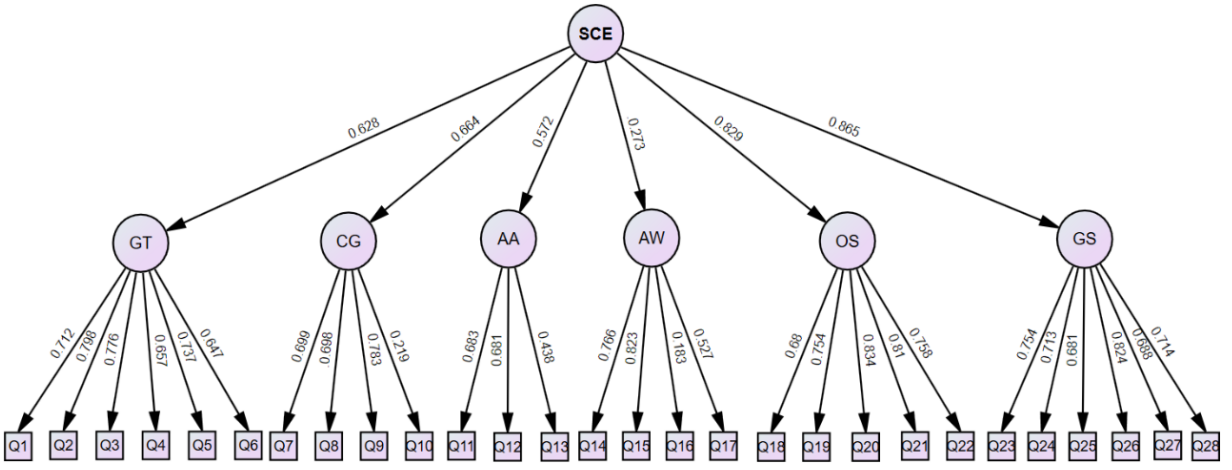

Figure 1 CFA of the students' blended learning course experience in Thai medical education

The students' blended learning course experience in Thai medical education consists of six components, and the second order of CFA confirmed that this model had a reasonable fit between the model and the empirical data. The result revealed that the model showed χ^2/df = 1.148, p = .055, RMSEA = .016, RMR = .005, SRMR = .053, GFI = .995, AGFI = .995, NFI = .961, and CFI = .995. For the first component of the students' blended learning course experience, "General Skills (GS)," the indicator "Q2" had the highest factor loading (β = .798). In the second component, "Online Sessions (OS)," the indicator "Q20" had the highest factor loading (β = .834). In the third component, "Clear Goals and Standards (CG)," the indicator "Q9" had the highest factor loading (β = .783). In the fourth component, "Good Teaching (GT)," the indicator "Q2" had the highest factor loading (β = .798). In the fifth component, "Appropriate Assessment (AS)," the indicator "Q11" had a higher factor loading (β = .683) than indicators Q12 and Q13, respectively. In the sixth component for "Appropriate Workload (AW)," the indicator "Q15" had the highest factor loading (β = .823).

Furthermore, these six components can explain the variability of the indicators in the student's blended learning experience model in Thai medical education. General skills were found to be the most important, explaining 74.8 percent of the variance. Online sessions explained 68.7 percent of the variance, Clear goals and standards explained 44.1 percent of the variance, and Good teaching explained 39.5 percent of the variance. Appropriate assessment accounted for 32.7 percent of the variance, while appropriate workload explained 0.74 percent of the variance in the SCE model.

Discussion

This study validates and examines the relationship between students' blended learning course experiences and empirical data in Thai medical education. Medical students moderately rated their overall perception at 3.40, possibly due to the COVID-19 outbreak, which has not yet allowed blended learning to reach its full potential. Gender factors did not play a statistically significant role in predicting these perceptions, consistent with studies by Savara and Parahoo (2018) and Yin and Ke (2017), but differing from Yin et al. (2016). Additionally, year level and GPAx did not play a statistically significant role. However, students gave relatively high ratings to their perceptions of good teaching, general skills, online sessions, clear goals and standards, appropriate assessment, and appropriate workload. These results reflect a student-centered academic system.

The study validated the six-factor structure of the students' blended learning course experience in Thai medical education using Confirmatory Factor Analysis (CFA), discussing each component in descending order of squared multiple correlation (R^2 value).

Firstly, General Skills, such as critical thinking, problem-solving, communication and teamwork, had the highest impact on the students' perception of blended learning. These skills are vital because the medical profession demands quick, effective decision-making collaboration and solving in real-world clinical settings. Blended learning environments enhance these skills by offering diverse learning activities like online activities, case studies, and problem-solving simulations. The online components allow students to engage with materials independently, fostering self-directed learning, while face-to-face interactions help them apply their knowledge in practice scenarios. For example, online forums and group assignments enhance communication and teamwork (He & Huang, 2017), while case scenarios and simulations improve critical thinking and problem-solving abilities (Hou, 2011). This is crucial for medical professionals working in multidisciplinary teams, shown as the studies of Asonitou et al. (2018) and Stergiou and Airey (2012), who found that the general skills component had the highest predictive value in the course experience structure of Greek students.

Secondly, Online Sessions are a significant factor in the success of blended learning. For medical students, flexibility and accessibility are critical, as they often juggle demanding clinical rotations. Online modules allow them to access course materials at their convenience, revisit challenging concepts, and learn at their own pace (Ally & Samaka, 2013). The asynchronous nature of many online activities allows students to review material multiple times, enhancing comprehension and retention. This adaptability supports the self-regulation required in the medical field, where continuous learning is essential for staying updated with medical advancements. Furthermore, online sessions offer interactive simulations and virtual case studies (Dailey-Hebert, 2018), which are vital in developing clinical decision-making skills. This is consistent with Kintu et al. (2017), who indicated that the quality of the learning management system can predict good performance in blended learning.

Thirdly, Clear Goals and Standards are crucial for guiding medical students through the complexity of their education. Medical education requires precise learning outcomes, and students must understand what

is expected or learning objectives of them in terms of both knowledge and practical skills. Blended learning environments with well-defined objectives ensure that all components both online and offline are aligned and contribute to the overall educational goals (Graham et al., 2013; Krajcik et al., 2008). This alignment is particularly important for medical students, who need to balance theoretical knowledge with practical skills, ultimately supporting student success.

Fourth, Good Teaching is essential in blended learning environments (Anthony et al., 2019), especially in medical education, where instructors play a pivotal role in guiding students through complex clinical and theoretical content. Instructors must be adept at using both online and face-to-face teaching methods to provide constructive feedback, clarify difficult concepts, and support students' learning journeys. Medical students benefit from teachers who can bridge the gap between theoretical knowledge and practical application, helping them to develop clinical reasoning skills. Although ranked fourth, good teaching remains an important component of blended learning (Asonitou et al., 2018; Ginns & Ellis, 2007; Ginns & Ellis, 2009; Ginns et al., 2007; Saputra et al., 2021; Stergiou & Airey, 2012). This lower ranking may be due to some medical teachers' lack of experience with blended learning methods.

Fifth, Appropriate Assessment in blended learning environments for medical students has less predictive value because in this context traditional assessments struggle to evaluate hands-on skills critical to medical practice, reducing their effectiveness in blended learning. Students often view online assessments as less rigorous, further diminishing their predictive value. Additionally, a heavy reliance on final exams can overlook continued clinical skills development. Therefore, medical teachers and instructional designer should combine formative and summative assessments to provide a comprehensive picture of student progress (Broadbent et al., 2021).

Lastly, Appropriate Workload, while workload is important, often receives lower predictive value in blended learning environments. Medical students, in particular, face significant demands on their time due to clinical rotations and intensive study schedules, consistent with previous studies (Ginns & Ellis, 2007; Stergiou & Airey 2012). Furthermore, the study by Asonitou et al. (2018) and Saputra et al. (2021) indicated that students may struggle to identify the "appropriate workload" factor due to negative wording in three of the four items in this component.

Conclusion and Recommendation

In conclusion, the second-order CFA confirmed that the indicator model accurately reflected students' blended learning course experience in Thai medical education. An effective blended learning quality assessment instrument can guide the design of the Doctor of Medicine program and other online and face-to-face courses, serving as a key part of educational quality assurance. The success of blended learning in Thai medical education depends on key factors such as developing general skills, online sessions, clear goals and standards, good teaching, appropriate assessment, and appropriate workload. These components are interrelated and significantly impact the effectiveness of blended learning, particularly for medical students. By focusing on these components, medical educators can create a more effective, engaging, and flexible learning environment that prepares students for the complexities of medical practice.

The findings of this study provide valuable insights into the effectiveness of blended learning in medical education, and the recommendations can be extended to broader social science. It is essential to apply similar research methods to explore how blended learning influences other professional fields that require practical skills. Future research in social science should focus on longitudinal studies to assess the sustained impact of blended learning on key outcomes such as professional competence, knowledge retention, and practical skills. This will help in understanding how blended learning shapes professional development over time. Additionally, research should explore the role of technological proficiency by examining the influence of digital literacy and access to resources in enhancing the effectiveness of blended learning. Future studies should focus on identifying gaps in access to technology and proposing solutions to bridge this divide, ensuring equitable opportunities for all students.

Lastly, research should investigate the impact of blended learning on key behavioral factors, including self-regulation, time management, and stress levels among medical students. Focusing on these areas can offer crucial insights into how students manage the demands of blended learning. Such findings would contribute to optimizing learning strategies and enhancing the overall effectiveness of medical education in Thailand. By understanding these behavioral outcomes, educators can tailor blended learning approaches to better support students' academic and emotional well-being.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Ethical Approval Statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Human Research Protection unit of Faculty of Medicine Siriraj Hospital, Mahidol University (protocol code 691/2562(EC1) and date of approval 3 March 2020.

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The development of a plagiarism instructional package to enhance undergraduate students' plagiarism knowledge, awareness, and behavior

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Abstract

This research aimed to (1) develop an instructional package for teaching research plagiarism ethics to undergraduate students; and (2) investigate the effects of the instructional package on undergraduate students' plagiarism knowledge, awareness, and behavior. The research methodology was quasi-experimental research using the two-group pretest-posttest design, where the experimental group received the pretest, the instructional package, and the posttest. In contrast, the control group was administered both the pretest and posttest without exposure to the instructional package. Participants were 62 undergraduate students from the Research for Learning and Teaching Development (RLTD) course. Research instruments included a knowledge four-option multiple-choice test, an awareness five-point Likert scale, and a three-point analytical rubric behavioral checklist with five dimensions. Data were analyzed using ANOVA and ANCOVA—the instructional package comprised learning objectives, teaching, teaching materials, and an assessment. After receiving the instructional package, experimental-group students' plagiarism knowledge and awareness increased at a statistical significance of .05. Moreover, the experimental group gained more significant knowledge than the control group at a statistical significance of .05. However, no significant difference in awareness was found between the two groups. Students receiving feedback on research proposals showed more significant ethical research behavior than those receiving no feedback.

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Introduction

Research is an essential tool for increasing knowledge in all academic disciplines. It can be incorporated into classroom instruction as research-based learning with a view to enhancing students' autonomous and lifelong learning (Brew, 2006; Brew & Saunders, 2020; Healey & Jenkins, 2006; Pitiyanuwat & Bunterm, 1994; Srikoon et al., 2014; Yurdakul, 2017). As such, undergraduate programs now aim to equip students with research knowledge and skills necessary to further study at a graduate level and work professionally in their prospective careers.

With this in mind, the Faculty of Education, Chulalongkorn University (2009) provides the Research for Learning and Teaching Development (RLTD) course as part of all undergraduate curricula. All third-year students are required to pass the course prior to becoming pre-service teachers in real schools. One significant topic in the course deals particularly with research ethics. Nevertheless, teachers often find that in the course, many students plagiarize research proposals and reports from online sources. This problem is persistent over the course.

Recent study also confirms this problem with findings indicating that the rate and possibility of plagiarism in published academic journals are increasing as it is now much easier for plagiarists to have access to online electronic databases and articles, such as websites, search engines, social media, and multimedia tools (Al-Hashmi et al., 2023; Errami & Garner, 2008; Hafner, 2001; Jones, 2011; Kampa et al., 2024; Nabee et al., 2020; Owen, 2001; Ryan, 2007; Wilson, 2001). Moreover, the current state of academic integrity faces more challenges due to advanced artificial intelligence (AI) tools, such as copying original work and immediately pasting on paraphrasing AI tools to avoid detection (Cotton et al., 2023; Khalil & Er, 2023; Lannoy, 2023; Xiao et al., 2022). Based on my experience, many students often plagiarize prior work in the literature review in different ways. For instance, some revise certain contents by changing date information, some do not cite original sources or provide references, and others do not write correct citations and references. These practices are considered as unethical practices. A follow-up interview with students also indicated that students received electronic files from their senior students, making it easier for them to commit plagiarism.

Previous studies about plagiarism have also found that university students lack an understanding of plagiarism and show different perceptions and practices toward plagiarism. These issues result in students not being aware of their academic dishonesty and conducting plagiarism in both unintended and intended ways (Al-Hashmi et al., 2023; Fish & Hura, 2013; Kampa et al., 2024; Nabee et al., 2020; Park et al., 2013; Power, 2009; Roig & Caso, 2005; Srisongkram, 2011; Starovoytova & Namango, 2016; Upadhyay et al., 2023). Students must avoid this unethical behavior in their studies and future careers, for it is regarded as unethical in society and the workplace (Rohmad & Wahyuni, 2018; Upadhyay et al., 2023). One way to increase awareness of plagiarism and promote proper practices in academic writing is to teach the correct concept and point out the effect of plagiarism to students (Al-Hashmi et al., 2023; Anney & Mosha, 2015; Fish & Hura, 2013; Powell & Singh, 2016; Power, 2009; Rohmad & Wahyuni, 2018).

In light of this problem of plagiarism, as one of the teachers in the course, I intended to develop an instructional package on research ethics with an emphasis on plagiarism for literature reviews for undergraduate pre-service students in the Faculty of Education, Chulalongkorn University (2009). The instructional package was designed in particular to promote students' knowledge, behavior, and awareness regarding plagiarism in literature reviews and thereby prevent them from committing plagiarism and unethical behavior. As displayed in Figure 1, the present study was set out to investigate the effect of the instructional package on students' plagiarism knowledge, behavior, and awareness, and to investigate plagiarism behavior of undergraduate students enrolled in the RLTD course.

The current instructional package was developed based on four main principles: (1) learning material development, (2) multimedia-assisted learning, (3) research-based learning, and (4) assessment for learning. Multimedia tools developed in this study consisted of a research report, VDO clips, a movie, and worksheets containing content on academic cheating behaviors and plagiarism issues, which suit students' characteristics.

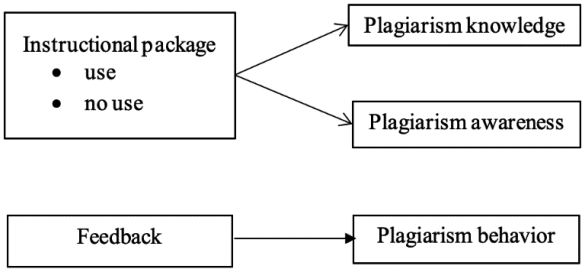

Figure 1 Research conceptual framework

The learning package in this study was a part of the research-based learning. It involved the development of a research proposal and assessment for learning and includes teacher feedback, self-assessment, peer assessment, teacher assessment, students' reflective learning report, and a plagiarism knowledge pretest and posttest.

All of the formative assessments will help students become more engaged in their learning (Earl, 2003). This study aims to prepare pre-service teachers with the necessary research knowledge and skills, as well as awareness of research ethics through research-based classroom learning. It is thus hoped that this study could serve as a preliminary tool for inculcating into students a sense of research ethics so that they will not commit plagiarism either intentionally or unintentionally. To this end, this research is aimed to (1) develop an instructional package for teaching research plagiarism ethics to undergraduate students in the Faculty of Education, Chulalongkorn University (2009); and (2) investigate the effects of the instructional package on undergraduate students' plagiarism knowledge, awareness, and behavior.

Research Hypotheses

1. Students who received instruction through the Research Ethics Package on Plagiarism for Undergraduate Students in the Faculty of Education, Chulalongkorn University (2009) based on the concept of using diverse learning media, have higher knowledge and awareness of research ethics related to plagiarism after learning compared to before learning.

2. Students who received instruction through the Research Ethics Package on Plagiarism, based on the concept of using diverse learning media, have higher knowledge and awareness of research ethics related to plagiarism than students who did not receive instruction through the Research Ethics Package on Plagiarism.

3. When controlling for the pre-learning knowledge and awareness of research ethics related to plagiarism, those who received instruction through the Research Ethics Package on Plagiarism have higher knowledge and awareness of research ethics related to plagiarism than those who did not receive instruction through the Research Ethics Package on Plagiarism.

4. Students who received feedback on suggestions for revising their research proposals based on the research-based learning approach and assessment for learning development have higher behaviors related to research ethics in plagiarism than students who did not receive feedback on suggestions for revising their research proposals.

Methodology

Participants

In this classroom action research study, 62 undergraduate students from two sections of the RLTD course were purposively selected. One section consisted of 32 students, and the other included 30 students. The researcher was responsible for teaching these sections. To investigate plagiarism knowledge and awareness, students were administered the pretest prior to the instruction and the posttest after the instruction. As shown in Figure 2, the current quasi-experimental research followed the two-group pretest-posttest design, where the experimental group received the pretest, the instructional package, and the posttes, and the controlled group were administered both the pretest and posttest without exposure to the instructional package.

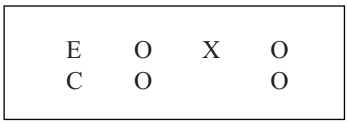

Figure 2 Experimental design

To examine plagiarism behavior, students were divided into four groups. The first group did not receive feedback but received the criteria for plagiarism behavior investigation. The second group received both feedback and the criteria for plagiarism behavior investigation. The third group did not obtain either feedback or the criteria for plagiarism behavior investigation. The fourth group received feedback but did not receive the criteria for plagiarism behavior investigation.

Intervention

The learning activities in the research for learning and teaching development course (RLTD) were designed throughout the semester. Table 1 provides additional details of learning activities and research tools within each period.

In April 2016, students learned to focus on the instruction through the research ethics package on plagiarism. Instruction through the research ethics package on plagiarism for undergraduate students in the Faculty of Education at Chulalongkorn University consisted of (1) learning outcomes, (2) learning management, (3) learning media, and (4) learning assessment.

Table 1 The Research for Learning and Teaching Development (RLTD) activities.

Period	Learning activity	Research tools
January 2016	- Testing knowledge and awareness of research ethics - Assigning students' task about reading research, writing research proposals, and doing research reports, along with setting deadlines for submitting each piece of work in the semester.	- Plagiarism knowledge test - Plagiarism awareness scale - Course syllabus
January - February 2016	Learning how to read and summarize research especially research topic on ethical research	- Summary research form
February 2016	Learning how to write a research proposal.	- The research proposal evaluation form with assessors including students and teacher
January -March 2016	Submitting the first draft of the research proposal by February 29, so that students would receive feedback for improving the work and submit their best work by March 31, 2016.	- Scoring rubric for research proposal assessment and - Research proposal evaluation form with assessors including students and teacher - Checklist for research ethic behavior (plagiarism) with assessors consisting of students and teacher
March -April 2016	Doing group research project and writing work research report on research ethics.	- A research report format with evaluators including students, peers, and teachers. - A checklist for verifying compliance with research writing principles (behavior of plagiarism in literature).
April 2016	Learning and discussion in experience on Instruction through the Research Ethics Package on Plagiarism	- PowerPoint and exercises related to research ethics on plagiarism - Reflection questions on research ethics
April 2016	Watch the film about the ethics of news writing by journalists, "Shattered Glass,"	- Learning activity task regarding the ethics of research writing
April 2016	- Testing on plagiarism knowledge test and plagiarism awareness scale	- Plagiarism knowledge test - Plagiarism awareness scale
April 2016	Listening to a lecture on how to write academic work without infringing copyright and avoiding plagiarism by Associate Professor. Manit Jumpha, Faculty of Law, Chulalongkorn University	- PowerPoint how to write academic work without infringing copyright and avoiding plagiarism

1. There were four learning outcomes after learning the Plagiarism Instructional Package. Students can (1.1) explain general knowledge and understanding of plagiarism, (1.2) identify actions that constitute plagiarism, (1.3) identify how to cite ideas or texts taken from the work of others, and (1.4) distinguish between plagiarized writing and non-plagiarized writing.

2. The learning management has three stages: introduction, learning process, and conclusion. In the introduction stage, students will discuss news about avoiding ethical issues in current situations, such as copying ideas, documents, or academic papers. In the learning process stage, students learn about the definition of plagiarism, types of plagiarism, plagiarism detector program, how to avoid plagiarism, how to write a paper properly and how to cite ideas and texts taken from others' work, the impact of research or academic plagiarism and example written work of plagiarism and non-plagiarism, and copyright and copyright infringement. Later, in the conclusion stage, students saw the video clip and discussion about ethical issues that they had learned. Before finishing the class, students received references and academic resources to study further. Moreover, they reflected on what they had learned.

3. The learning media used in the class consisted of news, songs, video clips from television programs, YouTube, PowerPoint, practice tasks, and computer, LCD, and Visualizer.

4. The learning assessment used discussion, task, plagiarism knowledge test, and plagiarism awareness scale.

Data Collection

Research instruments included ten items of a four-option multiple choice test of plagiarism knowledge with an alpha coefficient of .56, a five-point Likert scale of plagiarism awareness scale with an alpha coefficient of .72, a three-point analytical rubric checklist of plagiarism behavior with five dimensions, which was rated by the students, their peers, and the teacher. There was one section provided for suggestions and comments in the checklist. The inter-rater reliability among students, peers, and teachers was .77.

Data Analysis

Data were analyzed using descriptive statistics (frequency, percentage, mean, and standard deviation), Analysis of variance (ANOVA), and Analysis of covariance (ANCOVA)

Results

The instructional package was developed based on multimedia learning materials, research-based learning, and assessment for learning. The instructional package comprised four major components: (1) learning objectives, (2) a three-stage learning process, (3) learning materials, and (4) assessment and evaluation. Details of each component of the instructional package or the intervention are as follows.

Learning objectives include (1) identifying knowledge about plagiarism, (2) classifying plagiarism behavior, (3) identifying references in the text, and (4) classifying papers with or without plagiarism. Lesson plans consist of an introduction, instructional procedures, and a conclusion. The introduction introduces students to research ethics from other career news or hot issues, which are presented through songs, pictures, articles, and plagiarized research reports. The instructional process aims to stimulate students' attention. It involves content regarding the definition of plagiarism, types of plagiarism, plagiarism detection programs, plagiarism prevention, research paper writing without plagiarism, and the impact of plagiarism.

While learning, they receive questions and quick formative assessments during the lessons, asking them to classify written texts with and without plagiarism. Apart from the plagiarism content, students learn how to notice documents with and without copyright and how to inviolate copyright. Finally, the conclusion involves video-clip watching concerning how to avoid academic dishonesty, discussion of what students learn, and students' written reflections on the lesson. Teaching materials include news, articles, songs, and video clips, and the assessment process involves testing, questioning, practicing, and reflecting.

Table 2 shows plagiarism knowledge and awareness analysis results between the experimental and control groups. With the multiple comparison methods, the value of p for statistical significance, conventionally, .05, is divided by the number of statistical tests performed. So, in the pretest and posttest, p for statistical significance is set at .05 divided by 2, equal to .025, preventing a type I error rate from multiple ANOVA. Regarding the implementation of the instructional package, results showed that the experimental group demonstrated a statistically significant increase in plagiarism knowledge (tExp= 1.50, p = .000), whereas the controlled group's post-test scores on plagiarism knowledge were not significantly higher than the pretest scores (tCont = 1.95, p = .067). Both experimental and controlled groups showed a significant increase in plagiarism awareness at statistically significant levels (tExp= 3.85, p = .001, tCont = 3.01, p = .005).

When comparing plagiarism knowledge and awareness between experimental and control groups, it was found that there were no significant differences in plagiarism knowledge and awareness between the two groups at the beginning. After implementing the instructional package, however, the experimental group's plagiarism knowledge was significantly higher than that of the control group at a statistically significant level (FExp= 5.978, p = .018). Still, no significant difference was found regarding plagiarism awareness between the two groups (FCont = .310, p = .580).

Table 2 Plagiarism knowledge and awareness between the experimental group and control group.

Time	Group	*M*	*SD*	Source	*SS*	*MS*	*F*	*p*
				Knowledge of plagiarism				
Pretest	Experimental Group	3.563	1.544	Between Group	0.054	0.054	0.025	.876
	Control Group	3.500	1.383	Within Group	117.875	2.183		
	Total	3.536	1.464	Total	117.929			
Posttest	Experimental Group	5.615	1.576	Between Group	17.933	17.933	5.978*	.018
	Control Group	4.417	1.886	Within Group	143.987	3.000		
	Total	5.040	1.818	Total	161.920			
				Awareness of plagiarism				
Pretest	Experimental Group	3.957	0.444	Between Group	0.248	0.248	1.394	.243
	Control Group	4.089	0.396	Within Group	9.800	0.178		
	Total	4.019	0.424	Total	10.049			
Posttest	Experimental Group	4.415	0.445	Between Group	0.070	0.070	0.310	.580
	Control Group	4.488	0.502	Within Group	11.200	0.224		
	Total	4.450	0.470	Total	11.270			

Note: * $p < .05$.

Regarding the controlled group, results from ANCOVA in Table 3 and ANOVA in Table 2 showed similar outcomes regarding plagiarism knowledge and awareness. The experimental group demonstrated a significant gain of plagiarism knowledge at statistically significant ($p < .05$), with a moderate effect size (eta2 = 0.122, Cohen's f = 0.373). However, no significant difference was found with plagiarism awareness between the two groups with moderate effect size (eta2 = 0.007, Cohen's f = 0.084) (Cunningham & McCrum-Gardner, 2007).

Figure 3 shows the relationship between plagiarism behavior and types of feedback from the four groups of students: Received both feedback and criteria of plagiarism behavior checklist (FBCR), Received feedback (FB), Received criteria of plagiarism behavior checklist (CR), and Not received both feedback and criterion of plagiarism behavior checklist (CON). Students receiving feedback on research proposal writing showed higher scores on research proposal writing or less plagiarism behavior than those receiving no feedback at the p level of .01. There were three assessment methods used, including self, peer, and teacher assessment (Fself = 4.91, p = .005; Fpeer =4.41, p = .008; Fteacher = 8.82, p = .008). A high correlation coefficient existed between Self and teacher assessment (r = .81, p = .001). The relationship between peer and teacher assessment was moderate (r = .58, p = .001), and the relationship between self and peer assessment was very low (r =.29, p = .052).

Table 3 Plagiarism knowledge and awareness between the experimental group and control group when controlled by pre-test on plagiarism knowledge and awareness score

Sources of variance of plagiarism knowledge	Type III SS	MS	*F*	*p*
Corrected Model	49.863	24.932	9.872*	.000
Intercept	61.892	61.892	24.508*	.000
Plagiarism Instructional Package	15.123	15.123	5.988*	.019
Plagiarism knowledge pre-test score	34.510	34.510	13.665*	.001
Error	108.593	2.525		
Total	1359.000			
Corrected Total	158.157			
Effect size of plagiarism knowledge eta^2 = 0.122, Cohen's f = 0.373				
Sources of variance of plagiarism awareness	Type III SS	MS	*F*	*p*
Corrected Model	2.088	1.044	1.877	.165
Intercept	5.244	5.244	9.426*	.004
Plagiarism Instructional Package	1.117	1.117	2.007	.164
Plagiarism awareness pre-test scale score	1.223	1.223	2.198	.145
Error	23.921			
Total	998.450			
Corrected Total	26.010			
Effect size of plagiarism awareness eta^2 = 0.007, Cohen's f = 0.084				

Note: * $p < .05$.

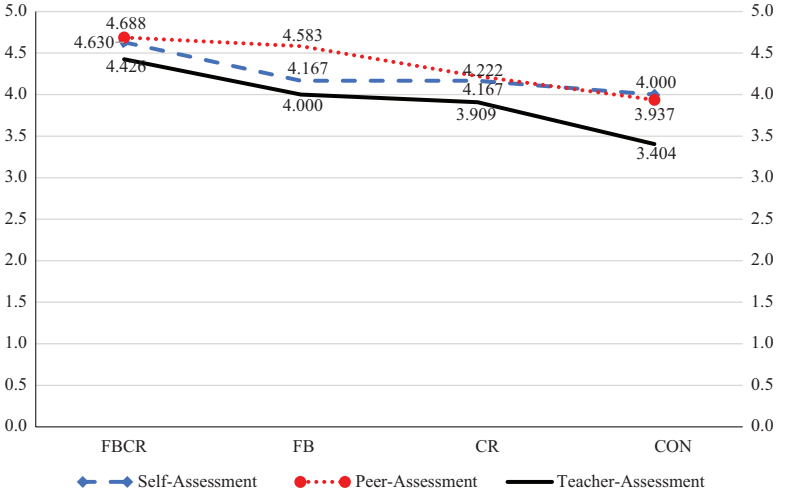

Figure 3 Research ethical behavior among students receives feedback and criteria of plagiarism behavior checklist differently

Discussion and Conclusion

The main findings indicate that the instructional package helped students to enhance their knowledge of plagiarism and awareness. These results are consistent with Srisongkram (2011), who found that students receiving the research ethics program had significantly higher scores on plagiarism understanding than those who did not participate in the program. Other studies showed that students had better knowledge and awareness after participating in the teaching of academic integrity and a campaign to raise awareness of the importance of plagiarism and research ethics (Curtis et al., 2013; EI-Shinawi et al., 2016; Smedley et al., 2015). This is also aligned with the recommendation of Madray (2007), who encourages universities to provide a program to enhance academic integrity skills for inexperienced students. For this reason, teachers are encouraged to promote the importance of research ethics and plagiarism in the classroom in order to prevent students from committing unethical behavior and avoid plagiarizing other people's work.

Results from ANOVA and ANCOVA indicate that the experimental group gained more knowledge than the control group. Still, no difference was found in relation to plagiarism awareness between the two groups. However, this research found that students receiving the instructional package showed no significant difference in plagiarism awareness between the groups. Additionally, the university campaign on avoiding plagiarism, and other lecturers may discuss topics related to research ethics. Therefore, students in both groups showed no significant difference in plagiarism awareness. This indicates that the instructional package is one of many ways to increase plagiarism awareness. Other methods to enhance plagiarism awareness include traditional teaching methods, research proposal feedback, university campaigns through websites or books, and discussions with other teachers.

The RLTD course provided the topic for research proposal writing during the fifth week of the course, whereas plagiarism and research ethics topics were provided during the last two weeks. For this reason, plagiarism behavior could not be checked at the beginning of the course, while plagiarism knowledge and awareness were pre-tested. Plagiarism behavior was directly measured from research proposal writing. Assessment criteria and feedback on research proposal writing helped students become more aware of plagiarism. Even though the control group did not get the instruction package, traditional teaching methods and lectures could help students become concerned about plagiarism. The study by Henslee et al. (2015) also confirms that an online tutorial and a pre-recorded lecture are equally effective in enhancing students' academic integrity.

As a result of this, the current study found no significant difference in plagiarism awareness between the controlled and experimental groups. It is recommended that future research courses start with research ethics and plagiarism topics in the beginning, prior to contents related to research proposal and report writing.

Teacher feedback helps students improve research ethical behavior. Those receiving feedback committed less plagiarism than those who could not send their research proposal on time and did not receive feedback. When students assess their research proposals by themselves (self-assessment) and assess their peers' work, this process helps students know and understand the evaluation criteria for research proposals. Furthermore, as the researcher announced that scores from self-assessment and peer assessment would not be counted on grading in this course, the result was that the scores from different sources, such as students, peers, and teachers, were more significantly related.

The three types of assessment used (teacher, self, and peer) yielded similar results. Students receiving both feedback and assessment criteria had higher scores in research ethical behavior than the other groups. This finding corresponds with previous findings found in the literature review related to formative assessment or assessment for learning to enhance students' achievement (Arwae, 2012; Black & William, 1998; Cauley & McMillan, 2010; Lumthong, 2010; Maeteepithaktham, 2012; Panurat, 2010; Popham, 2008). Besides, Panurat (2010) found that self-assessment using a checklist, and an open-ended questionnaire helped students improve their writing skills. Lumthong (2010) also found that students obtaining feedforward or information to improve their work helped increase students' visual art development. Many studies also revealed that peer feedback helped Thai students enhance their writing skills (Arwae, 2012), and students receiving elaborative and suggestive feedback were better at problem-solving skills than those gaining corrective feedback (Maeteepithaktham, 2012). Furthermore, research-based learning helped undergraduate students enhance their knowledge and academic performance (Brew & Jewell, 2012; Sumbawati & Anistyasari, 2018; Walkington et al., 2011).

The instructional package should comprise learning objectives, teaching process, teaching materials, and assessment in all lesson plans (Supaprot, 1995). The package would help students gain a better understanding and awareness of plagiarism and avoid committing plagiarism when conducting research. The literature review suggested that learning package development should stimulate students' interest in the learning package by using multimedia tools such as news, pictures, video clips, and online materials. These multimedia tools make the classroom more interesting than traditional teaching methods (Jatuverapong, 2012; Srikaewkul, 2002; Suwannawaj, 2011). Development of an instructional package is one way to create a better understanding and concern about research paper writing without plagiarism at the undergraduate level instead of teaching this topic at the graduate level in Thailand.

Recommendation

Teachers should take action by making plagiarism an explicit topic in their lessons. This could help students understand why it is important to acknowledge other people's work. Teachers are also encouraged to explain and provide models on how to paraphrase and cite original sources, as well as provide the opportunity for students to write actual research papers. It is also important for teachers to evaluate students' written drafts before they complete their final papers and try to inform them of the plagiarism acts in their papers. Moreover, students should be taught how to search the internet in order to locate and use information from reliable and trustworthy sources (Evering & Moorman, 2012). If possible, further research should measure plagiarism through plagiarism checkers or AI-assisted tools after implementing the instruction package.

Conflict of Interest

The author declares that there is no conflict of interest.

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The relationship between transformational leadership, teachers' organizational commitment, and job satisfaction: An integrated investigation using meta-analysis and structural equation modeling

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Abstract

This study employs meta-analysis and structural equation modeling (SEM) to examine the relationships between transformational leadership, teachers' organizational commitment, and job satisfaction. Meta-analysis shows significantly positive effects of transformational leadership on job satisfaction (effect size = 0.65) and teachers' organizational commitment (effect size = 0.579), with a significant correlation between teachers' organizational commitment and job satisfaction (effect size =0.681). SEM analysis further indicates direct effects of transformational leadership on teachers' job satisfaction (0.365) and organizational commitment (0.646), as well as a direct effect of teachers' organizational commitment on job satisfaction (0.548). Crucially important is that teachers' organizational commitment serves as a mediator between transformational leadership and job satisfaction, with the estimated mediation effect of 0.354. These findings highlight the importance of enhanced transformational leadership to fostering teachers' organizational commitment and job satisfaction. Future research may deepen into the dimensions and interactions of these variables by adopting a multimethod research design.

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Introduction

In recent years, with the acceleration of globalization and technological innovation, school education faces unprecedented challenges and opportunities. To keep pace with the impact of education for sustainable development, transformational leadership has been widely recognized as a vital means to adapt to environmental changes so as to enhance the quality of education. As implementers of school education, teachers' job satisfaction affects the quality and effectiveness of education and teaching. Investigating the impact of transformational leadership

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styles on teachers' job satisfaction bears significances in theoretical and practical implications for school development, teacher well-being and work efficiency, which in turn would lead to the improvement of educational quality.

In the field of organizational behavior, transformational leadership has been widely regarded as a leadership style that promotes innovation and organizational change, and significantly impacts employees' job satisfaction (Bass & Avolio, 1994). Job satisfaction, as a key indicator measuring employees' emotional reactions and attitudes towards their jobs, has profound effects on organizational performance, employee retention, and team collaboration (Judge et al., 2001). Although existing research generally supports the positive impact of transformational leadership on university teachers' job satisfaction, there is still considerable disagreement within the academic community regarding the consistency of its efficacy and the precise mechanisms behind practices of transformational leadership. This divergence stems not only from differences in research methods and sample selection but also from the cultural diversity of research contexts.

Given the limitations present in individual studies, such as sample size, research design differences, and the influence of cultural backgrounds, a comprehensive understanding of the relationship between transformational leadership and teachers' job satisfaction remains elusive. To overcome these limitations, this study employs a systematic integration of existing research through meta-analysis and structural equation modeling path analysis. It aims to evaluate the overall impact of transformational leadership on teachers' job satisfaction comprehensively. By doing so, it seeks to elucidate the extent of its influence and delineate the specific mechanisms through which it operates. The proposed approach provides a theoretical basis and practical guidance for implementing transformational leadership strategies in school education and offers new perspectives and ideas for future research directions.

Literature Review

The theory of transformational leadership was first introduced in 1978, where a distinction was made between transactional and transformational leadership (Burns, 1978). The latter approach highlights the collaborative pursuit of values and goals between leaders and followers, aiming to inspire and elevate the motivations of followers and guide them towards achieving superior performance. This theory was further expanded in 1985, identifying four components of transformational leadership: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration, each of which has the potential to affect employees' intrinsic motivation (Bass, 1985).

The concept of job satisfaction has its roots in the pioneering work of psychologist in the 1950s (Herzberg, 1959). Job satisfaction is defined as "a person's positive emotional response to their job" (Locke, 1976). Specifically, in the field of organizational behavior, job satisfaction is considered a vital indicator of employee feedback regarding their work environment, conditions, and job characteristics.

Organizational commitment was conceptualized as a work-related attitude, characterized as the extent to which an employee aligns with the goals of an organization and desires to remain a part of it (Robbins & Judge, 2016). A three-component model of organizational commitment, including Affective Commitment, Continuance Commitment, and Normative Commitment, was further introduced, marking a pivotal milestone in the exploration of organizational commitment and profoundly enriching the understanding of the concept (Meyer & Allen, 1991).

In the field of education research, Zhang et al. (2022) conducted a detailed analysis of China's education system, revealing a notable positive link between transformational leadership and teachers' Job Satisfaction. This study underscores the critical role of transformational leadership, illustrating how it substantially elevates teachers' job satisfaction through promoting positive identification with their professional environment and responsibilities (Zhang et al., 2022).

Nonetheless, some studies have reported the minimal significance or complexity of the connection between transformational leadership and job satisfaction. One instance is Thien's investigation (2019) into the relationship among distributive leadership functions, readiness for change, and teachers' affective commitment to change. This study found that when transformational leadership acts as a mediating variable, its direct impact on teachers' job satisfaction is complex. Employing Partial Least Squares analysis, this study also revealed that the link between leadership style and job satisfaction is influenced by multiple factors, including organizational readiness for change and the distribution of leadership functions (Thien, 2019). In view of the above discussions, the impact of transformational leadership on job satisfaction may not be linear. Instead. it is affected by a combination of factors such as organizational environment, cultural background, and individual differences. Building upon this foundation, the present study proposes:

H1: Transformational leadership has a significantly positive effect on Teachers' job satisfaction.

Research by Ramalho Luz et al. (2018) highlights the importance of high employee commitment levels in minimizing turnover consequences, suggesting that organizational commitment is positively correlated with the desire to stay within the organization. A recent study by Ji et al. (2022) further supports the notion that affective commitment acts as a mediator in the relationship between transformational leadership and job satisfaction. This research underscores the substantial impact that principals' transformational leadership can wield over teachers' job satisfaction, primarily by fostering of affective commitment. Similarly, Liu (2015) pointed out in a study in Kaohsiung that principals' transformational leadership behavior could enhance teachers' organizational commitment by improving their job satisfaction and sense of identification with the organization (Liu, 2015).

Drawing from the aforementioned findings, the present study suggests that organizational commitment significantly influences the relationship between transformational leadership and job satisfaction. Therefore, the hypotheses are as follows:

H2: A significantly positive relationship exists between transformational leadership and teachers' organizational commitment.

H3: A significantly positive relationship exists between teachers' organizational commitment and job satisfaction.

H4: Teachers' organizational commitment mediates the relationship between transformational leadership and job satisfaction.

Methodology

Research Approach

In the initial phase, the present undertaking primarily utilized the meta-analysis method to conduct a comprehensive and systematic quantitative analysis of correlational results concerning the relationship between transformational leadership and job satisfaction. Building upon results of the meta-analysis, the study further employed Structural Equation Modeling (SEM) to analyze the relationships among transformational leadership, Teachers' Organizational Commitment, and Job Satisfaction through path analysis, which allows for detecting the direct impacts of transformational leadership on teachers' organizational commitment and Job Satisfaction, and estimating the strength and mechanism of Teachers' Organizational Commitment as a mediating variable.

Sample Collection

Theoretically, a meta-analysis should include all accessible published and unpublished research findings, covering four main types of literature: books, journals, dissertations, and unpublished manuscripts. However, studies by Rosenthal (1992) have found no evidence suggesting that some sources are more prone to bias than others among the four main types of literature sources in meta-analysis. This study, therefore, used journals and dissertations as sources of literature, with corrections made for potential sampling biases encountered during the research process.

The search spans from January 2001 to December 2023, employing Chinese and English keywords 'Transformational Leadership', 'Job Satisfaction', 'Organizational Commitment' etc., as preliminary search parameters. Searches were conducted in both Chinese and English databases, including CNKI, WANFANG DATA, Airiti Library, Web of Science, Elsevier Science, EBSCO, Springer Link, PsycINFO (for psychology), and ERIC (for education), eliminating duplicates and samples that do not match the research theme and objectives. Additionally, to avoid omissions, a citation tracing technique was applied to the preliminarily extracted literature by revisiting literature reviews and references of related publications to further track potential literature.

Inclusion Criteria

To ensure the meta-analysis's metric needs were met and heterogeneity among studies were reduced, this study established a set of strict selection criteria prior to collecting literature, aiming to filter studies that meet the research requirements. These criteria include:

Language Limitation: Given the researchers' proficiency in both Chinese and English, which minimizes language interpretation errors, this paper exclusively collected research literature written in these languages. Each selected document must clearly indicate the author(s), publication year, and document type.

Type of Study: The selected studies must be confined to the educational field, specifically quantitative research related to the relationship between transformational leadership style, teachers' job satisfaction, and organizational commitment, and utilize survey methods. Qualitative studies were excluded in the sample for analysis.

Effect Size Requirements: The literature must provide explicit correlation coefficients (*r*-values), sample sizes, and Cronbach's alpha values for the variables. Studies presenting canonical correlation, multiple regression analysis, structural equation modeling, or other quantitative analyses without reporting these numerical values were excluded.

Recency Priority: If there existed multiple pieces of literature on the same research subject, the most recent study results were prioritized for analysis. For studies with duplicate content, the literature offering more comprehensive data are selected for the meta-analysis.

Data Coding

During the data coding phase, this study initially involved a consultation among the three authors to determine the coding contents, which included basic information about the study (such as author names, publication dates), sample sizes, variable correlation values (effect sizes), types of articles (journal articles, dissertations), and Cronbach's alpha values. Subsequently, the first and third authors independently completed the preliminary coding using Excel software. After the content coding was finished, the second author mediated a joint review of the coding results by all three authors, discussing any discrepancies until consensus was reached. This process was adopted to ensure that coding consistency exceeded 90 percent. Then, the study utilized CMA 3.0 (Comprehensive Meta-Analysis 3.0) software to analyze the selected literature, calculate composite effect sizes, and test for heterogeneity and publication bias among the research samples.

Data Processing

CMA 3.0 was employed as a statistical analysis software to input the necessary data for analysis, including the names of the researchers, correlation coefficients, and sample sizes. Given that the data from an ample of studies reported correlation coefficients *(r)*, this research followed the method proposed by Schmidt and Hunter (2015), using the R-to-Fisher's Z transformation steps while adjusting the correlation coefficients, using the number of samples as the weight (Schmidt & Hunter, 2015). This approach is based on the assumption that the larger the sample size, the higher the accuracy of the study; therefore, a higher weight should be assigned.

To convert correlation values to Fisher's z, the formula for Fisher's z transformation in relation to correlation *(r)* was used:

$$z = 0.5 \cdot ln\left(\frac{1+r}{1-r}\right)$$

Where *ln* represents the natural logarithm. The Fisher's z transformation is commonly used to improve the normality of correlation coefficients when performing statistical analyses.

The inverse operation of Fisher's Z transformation is used to convert Z scores back to Pearson correlation coefficients (*r*). The formula is as follows:

$$r = \frac{e^{2z}-1}{e^{2z}+1}$$

Yes, *e* is the base of the natural logarithm. This formula was used to convert Fisher's Z scores back into the original correlation coefficients.

For calculating the 95 percent confidence interval of the original correlation coefficients from the Fisher's Z score, the formula was as shown below:

$$Lower = \bar{E}S - Z_{(1-a)} \times SE_{\bar{E}S}$$

$$Upper = \bar{E}S + Z_{(1-a)} \times SE_{\bar{E}S}$$

Results and Discussion

Coding Results

After collecting samples and screening literature based on the aforementioned inclusion criteria, a total of 34 articles met the conditions and were subjected to further data coding. Studies examining the relationship between transformational leadership and teachers' job satisfaction (hereinafter referred to as AB) included 12 articles for analysis, with correlation coefficients ranging from 0.351 to 0.88 and a total sample size of 6,692 individuals. Table 1 summarizes the main literature samples included in this group.

Thirteen studies explored the relationship between transformational leadership and teachers' organizational commitment (hereinafter referred to as AC). The correlation coefficients ranged from 0.306 to 0.828, and the total sample size was 9,194 individuals. The details of these studies are presented in Table 2.

Eleven studies focused on the relationship between teachers' organizational commitment and job satisfaction (hereinafter referred to as CB). The correlation coefficients ranged from 0.213 to 0.98, with a total sample size of 4,346 individuals. The coding results for this set of studies are shown in Table 3.

Table 1 Summary of Literature Samples (Transformational Leadership*Teachers' Job Satisfaction)

Number	Researcher (Year)	Language	Form	r	Sample Size	TFL Cronbach's α	TJS Cronbach's α
AB01	LIANG, D. C. (2001)	Chinese	Master's Thesis	0.88	686	0.9889	0.9523
AB02	Tian, L. L. (2005)	Chinese	Master's Thesis	0.675	318	0.948	0.836
AB03	Zhou, C. B., and Fan, C. W. (2006)	Chinese	Journal Article	0.708	1120	0.9823	0.9615
AB04	Wang, L. L. (2009)	Chinese	Master's Thesis	0.575	415	0.819	0.894
AB05	LI,D.J. (2010)	Chinese	Master's Thesis	0.531	202	0.955	0.757
AB06	Zhang, X. X. (2012)	Chinese	Master's Thesis	0.351	316	0.881	0.828
AB07	Zhang, X. Z. (2012)	Chinese	Master's Thesis	0.463	465	0.985	0.935
AB08	ZHAO, Q. & XI, R. (2018)	Chinese	Journal Article	0.648	1040	0.97	0.87
AB09	JIA, J.W. (2020)	Chinese	Master's Thesis	0.577	1323	0.969	0.921
AB10	Thein, M. and Vinitwatanakhun (2021)	English	Journal Article	0.675	60	0.948	0.938
AB11	Ji, C., Feng, B., and Zhao, H. (2022)	Chinese	Journal Article	0.721	336	0.959	0.906
AB12	Panagopoulos et al. (2024)	English	Journal Article	0.737	411	0.903	0.93

Table 2 Summary of Literature Samples (Transformational Leadership*Teachers' Organizational Commitment)

Number	Researcher (Year)	Language	Form	r	Sample Size	TFL Cronbach's α	TOC Cronbach's α
AC01	Fun, C. (2005)	Chinese	Journal Article	0.7	1062	0.9435	0.9449
AC02	Tsai, C. (2005)	Chinese	Journal Article	0.624	897	0.9764	0.9026
AC03	Chin, J. M. and Wu, J. (2006)	Chinese	Journal Article	0.633	1035	0.9758	0.85
AC04	Cao, K.Y. (2007)	Chinese	Master's Thesis	0.575	402	0.92	0.91
AC05	Li, D. J. (2010)	Chinese	Master's Thesis	0.306	202	0.955	0.802
AC06	Khasawneh et al. (2012)	English	Journal Article	0.5	340	0.89	0.92
AC07	Tu, T. (2013)	Chinese	Journal Article	0.65	547	0.98	0.93
AC08	Feizi et al. (2014)	English	Journal Article	0.33	196	0.8	0.8
AC09	Xie, C. H. (2017)	Chinese	Journal Article	0.513	198	0.8023	0.8347
AC10	Li, L., Wang, J. P., and Li, X. Y. (2018)	Chinese	Journal Article	0.828	2196	0.971	0.906
AC11	Li, S. N. (2019)	Chinese	Master's Thesis	0.622	484	0.936	0.923
AC12	Han, X. M. (2020)	Chinese	Journal Article	0.488	650	0.943	0.754
AC13	Zhang, W. Y., and Mao, Y. Q. (2022)	Chinese	Journal Article	0.498	985	0.905	0.913

Table 3 Summary of Literature Samples (Teachers' Organizational Commitment*Teachers' Job Satisfaction)

Number	Researcher (Year)	Language	Form	r	Sample Size	TOC Cronbach's α	TJS Cronbach's α
CB01	Feather and Rauter (2004)	English	Journal Article	0.36	154	0.85	0.76
CB02	Li, L. (2007).	Chinese	Master's Thesis	0.817	398	0.857	0.924
CB03	LI,D.J. (2010)	Chinese	Master's Thesis	0.327	202	0.802	0.757
CB04	Peng, J. F. (2011)	Chinese	Master's Thesis	0.213	239	0.857	0.924
CB05	Anari. (2012)	English	Journal Article	0.497	84	0.71	0.75
CB06	Zhang, S, W. (2015)	Chinese	Master's Thesis	0.577	350	0.793	0.948
CB07	Mouloud et al. (2016)	English	Journal Article	0.98	100	0.989	0.99
CB08	Chen, X. Y., and Liu, X. (2021)	Chinese	Journal Article	0.42	1800	0.84	0.89
CB09	Luo, J. J. (2022).	Chinese	Master's Thesis	0.662	432	0.802	0.757
CB10	Cayupe et al. (2023)	English	Journal Article	0.68	300	0.98	0.88
CB11	Harb et al. (2023)	English	Journal Article	0.908	287	0.806	0.839

Note: Table 1, Table 2, Table 3

A = TFL = Transformational Leadership; B = TJS = Teachers' Job Satisfaction; C = TOC = Teachers' Organizational Commitment

AB05, AC05, and CB03 are from the same publication and have been individually accounted for in the studies of different variable relationships.

Heterogeneity Test Results

The heterogeneity of effect sizes was computed using the Cochrane Q test, p value testing, I^2 heterogeneity indicators, and tau-squared (tau²) values. The Q statistic (including p value testing) was primarily used to test for the presence of heterogeneity. The I^2 heterogeneity indicator reports values between 0 and 100 percent, with heterogeneity categorized as low (25%), moderate (50%), and high (75%). The tau² value indicates the degree of dispersion of effect sizes, with larger values indicating greater heterogeneity between groups.

According to the meta-analysis results (Table 4), the heterogeneity test results for the AB studies show significant heterogeneity across studies (Q = 391.583, p < .001), with a tau² value of 0.065 and an I-squared (I^2) value of 97.19 percent.

The AC studies' heterogeneity test results yielded a high heterogeneity across studies (Q = 570.187, p < .001), with a tau² value of 0.069 and an I^2 value of 97.9 percent.

Similarly, the CB studies' heterogeneity test results also indicated a high heterogeneity across studies (Q = 737.38, p < .001), with a tau² value of 0.215 and an I^2 value of 98.64 percent. Given that the I^2 values for all three relationships exceeded 75 percent, it suggested that nearly all variations are due to heterogeneity between studies rather than chance error. In cases of high heterogeneity, employing a random effects model is more appropriate than a fixed effects model. Consequently, subsequent research in the present study primarily utilized a random effects model to explore potential moderating variables, thereby enhancing our understanding the heterogeneity of effect sizes.

Publication Bias Test Results

Sharpe (1997) noted that some significant research papers might be excluded from analyses, making it impossible to compile a complete collection of similar studies—a situation that can lead to publication bias due to missing values. A funnel plot is a primarily visual tool used to assess publication bias. If the plot demonstrates symmetry around the central effect size, it indicates no publication bias. However, due to the potential subjectivity of this method, this paper employed Egger's linear regression test, the non-parametric rank correlation (Begg) test, and the fail-safe number to provide auxiliary validations.

From Table 5, it can be seen that the effect sizes for research items AB, AC, and CB are primarily concentrated at the top of the funnel plot and are symmetrically distributed around the mean effect size, indicating no issue with publication bias.

From Table 6, the actual test values indicate the following: Regarding the AB relationship based on the Egger regression test, the beta coefficient was -1.901; the standard error was 5.225; the corresponding t-value was -0.364, with 10 degrees of freedom. The p value of 0.724 indicated that there was not enough statistical evidence to support the presence of publication bias. In the Begg and Mazumdar rank correlation test, Kendall's S statistic (P-Q) was -8, the unadjusted Kendall's tau value was -0.121; the corresponding z-value was 0.549, and the two-tailed p value was .583, suggesting that there existed insufficient statistical evidence to support the presence of publication bias.

Table 4 Summary of Meta-Analysis Results (Including Heterogeneity Findings)

	Meta-Analysis Results							Heterogeneity Findings				
	Mode	Number Studies	Point estimate		95%CI	Z	P	Q	df (Q)	P	I^2(%)	tau2
AB	Fixed	12	0.664	0.650	0.677	65.232	0	391.583	11.000	0.000	97.191	0.065
	Random effects	12	0.650	0.556	0.728	10.261	0					
AC	Fixed	13	0.661	0.649	0.672	76.026	0	570.187	12.000	0.000	97.895	0.069
	Random effects	13	0.579	0.474	0.667	8.899	0					
CB	Fixed	11	0.594	0.574	0.613	44.876	0	737.380	10.000	0.000	98.644	0.215
	Random effects	11	0.681	0.504	0.803	5.884	0					

Table 5 Funnel Plot for AB, AC, and CB Studies

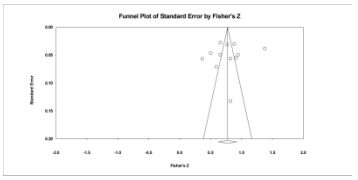
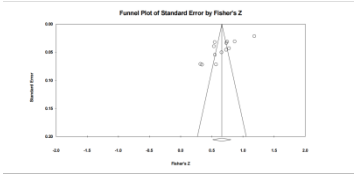
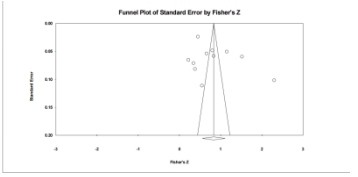
AB	AC	CB
		

Table 6 Publication Bias Test Results for AB, AC, and CB Studies

	Edger's linear regression test					the non-parametric rank correlation (Begg) test				Classic Fail-safe N					
	beta1	SE	t	df	p(2-tailed)	Kendall's score	tau	z	p (2-tailed)	z	p	Alpha	z for Alpha	k	Fail-safe N
AB	-1.901	5.225	-0.364	10	0.724	-8	-0.121	0.549	0.583	60.487	0	0.05	1.96	12	1418
AC	-14.646	3.725	3.932	11	0.002	-32	-0.410	1.952	0.051	65.03	0	0.05	1.96	13	4299
CB	7.998	5.705	1.402	9	0.195	7	0.128	0.545	0.586	45.424	0	0.05	1.96	11	5898

According to the findings by Rhoades and Eisenberger (2002) and Rosenthal (1979), the Fail-safe N should be five times the number of studies included in the analysis (k) plus 10, following the "5k + 10" rule (Rhoades & Eisenberger, 2002) (Rosenthal, 1991). In the classic fail-safe N test, the *Z* value for assessing publication bias was 60.48739, with a *p* value of 0, and a fail-safe number of 1418, demonstrating a minimal likelihood of publication bias, which allowed for the direct use of the calculated pool of effect size for further research.

With respect to the AC relationship, based on the Egger regression test, the beta value was -14.646; the standard error was 3.725, the *t*-value was -3.932, with 11 degrees of freedom, and the *p* value of .002. This result suggested the possibility of statistically significant publication bias. However, based on the Begg and Mazumdar rank correlation test, Kendall's S statistic (P-Q) was -32; the unadjusted tau value was -0.410, with a z-value of 1.952, and a *p* value of .051, indicating that the presence of publication bias was not present.

According to Rosenthal's "5k+10" rule, the classic fail-safe N analysis yielded a Z value of 65.03, with *p* value of .000, and a fail-safe number of 4,299, suggesting that at least 4,299 unpublished studies needed to raise the overall *p* value above .05. The above findings also indicated a strong resistance of the analysis results to unpublished studies and implied a minimal likelihood of publication bias. Considering the above results, the study concluded that there was no publication bias in the relationship between transformational leadership and organizational commitment, and the calculated pool of effect size can be used directly for further research.

For the CB relationship, the Egger regression test provided the beta value of 7.998, the standard error of 5.705, the t-value of 1.402, a *p* value of .195. In the Begg and Mazumdar rank correlation test, Kendall's S statistic (P-Q) was 7; the unadjusted tau value was 0.128, with a z-value of .545, and a *p* value of .586. In the classic fail-safe N test, the Z value for assessing publication bias was 45.424, with a *p* value of .000, and a fail-safe number of 5898. All three tests indicated no apparent publication bias, allowing for the direct use of the calculated pool of effect size for further research.

Path Analysis Results

To verify the relationship model among transformational leadership, teachers' organizational commitment and job satisfaction, a correlation matrix was established using the correlation coefficients between these variables. The weighted average values of random effects were utilized in the analysis. The correlation matrix is presented in Table 7.

Table 7 Meta-analysis Effect Value Correlation Matrix Based on Structural Equation Model

Variable	Cronbach's α	1-α	$\sqrt{\alpha}$	A	B	C
A	0.932	0.068	0.965	1		
B	0.876	0.124	0.936	0.65	1	
C	0.861	0.139	0.928	0.579	0.681	1

After the relevant matrices are established, the harmonic mean of the sample sizes for three research topics of transformational leadership, teachers' organizational commitment, and job satisfaction needed to be calculated. This harmonic mean would serve as the sample size for structural equation model validation analysis. The formula for calculating the harmonic mean is as follows:

$$H = \frac{1}{\frac{1}{m}\sum_{i=1}^{m}\frac{1}{n_i}}$$

According to the approach proposed by Viswesvaran and Ones (1995), the sample sizes for the three research topics are provided as follows: 6692, 9194, and 4346, respectively. Taking the harmonic mean of these three values yields 6,144, which served as the sample size for model validation analysis. Based on the principle of structural equation model reliability, the variance of measurement residuals was set to 1−α (where α represents the average reliability), and the non-standardized factor loadings are determined $\sqrt{\alpha}$. The sample size for the model, set at 6,144, was the harmonic mean of the sample sizes from each study. The model was then imported into AMOS 24.0 software for path analysis to validate

the conceptual model, as illustrated in Figure 1. Model estimation was conducted using the maximum likelihood method, resulting in both CFI and GFI values reaching 1.000. This demonstrated excellent model fit and reflected strong consistency between the observed data and the model expectations.

Direct effects

Direct effects, i.e., path coefficients, are shown in Table 8. The estimated impact of transformational leadership (A) on teachers' organizational commitment (C) was 0.646, with a standard error of 0.012 and a critical ratio (C.R.) of 55.510. The *p* value displayed as ***, indicated that this estimate was highly significant. Similarly, the impact of teachers' organizational commitment (C) on teachers' job satisfaction (B) was estimated at 0.548, with a standard error of 0.014 and a critical ratio of 39.660, which was highly significant. The direct impact of transformational leadership (A) on teachers' job satisfaction (B) is estimated at 0.365, with a standard error of 0.013 and a critical ratio of 27.476, and again highly significant.

Indirect Effects

In line with the research hypotheses, indirect effects here referred to the effect of the independent variable on the dependent variable through an intervening variable. Referring to the model displayed in Figure 4-1, transformational leadership (A) served as the independent variable, teachers' job satisfaction (B) as the dependent variable, and teachers' organizational commitment (C) as the mediating variable. This study employed the Monte Carlo Confidence Interval Method to estimate the mediating effect. This approach calculates the confidence interval for the product of coefficients a and b, based on their point estimates, which helps determine the significance of the mediating effect (Preacher & Selig, 2012).

The total effect of transformational leadership (A) on teachers' job satisfaction (B) was 0.719, which included both the direct effect (0.365) and the indirect effect through teachers' organizational commitment (C) (0.354). Teachers' organizational commitment (TOC) was strongly influenced by transformational leadership (A) (0.600), and similarly, teachers' job satisfaction (TJS) was influenced by both variables (A: 0.673, C: 0.513). Specific effect values are detailed in Table 9.

Table 8 Summary of Path Analysis Results

DV <--- IV	Estimate	*SE*	*CR*	*p*
C <--- A	0.646	0.012	55.510	<.001***
B <--- C	0.548	0.014	39.660	<.001***
B <--- A	0.365	0.013	27.476	<.001***

Note: ****P<.001*

Table 9 Direct, Indirect, and Total Effects Table

Path	Direct	Indirect	Total Effects Table	Standardized Direct Effects	Standardized Indirect Effects	Standardized Total
C <--- A	0.646	NA	0.646	0.646	NA	0.646
B <--- C	0.548	NA	0.548	0.548	NA	0.548
B <--- A	0.365	0.354	0.719	0.365	0.354	0.719
TOC <--- A	NA	0.6	0.6	NA	0.6	0.6
TJS <--- A	NA	0.673	0.673	NA	0.673	0.673
TJS <--- C	NA	0.513	0.513	NA	0.513	0.513

Note: *CR* stands for Critical Ratio. NA stands for Not Applicable, which means it is not applicable for fixed parameters or when the standard error and *CR* values for calculated indirect effects are not provided.

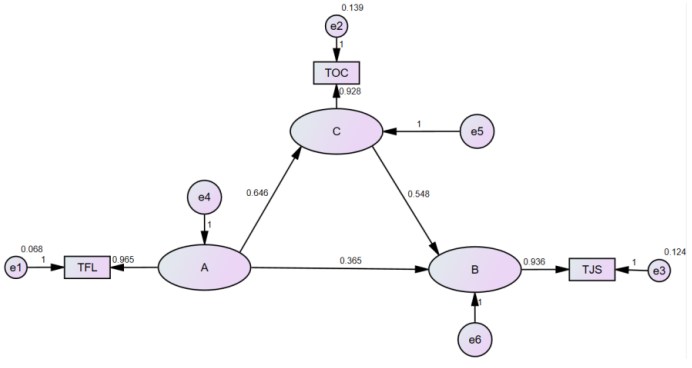


Figure 1 Path Analysis Diagram (Data computed by AMOS 24.0 software)

Conclusion and Recommendation

Positive Relationships Among Transformational Leadership, Teachers' Organizational Commitment, And Job Satisfaction

The results of the meta-analysis revealed that there existed a positive relationship between transformational leadership and teachers' job satisfaction. Utilizing a random-effects model, the overall correlation coefficient was calculated at 0.650, with a 95 percent confidence interval ranging from 0.556 to 0.728. The Z-value was 10.261, with a p value of .000. The meta-analysis results strongly demonstrated a significant positive correlation between transformational leadership and teachers' job satisfaction.

Similarly, the relationship between transformational leadership and teachers' organizational commitment was examined. The overall correlation coefficient, calculated by a random-effects model, was found to be 0.579, with a 95 percent confidence interval ranging from 0.474 to 0.667. The Z value was 8.899, with a p value of .000. These findings suggested that even after considering heterogeneity among studies, the positive correlation between transformational leadership and teachers' organizational commitment remains statistically significant.

Furthermore, the relationship between teachers' organizational commitment and job satisfaction was explored. Employing a random-effects model, the overall correlation coefficient was found to be 0.681, with a 95 percent confidence interval ranging from 0.504 to 0.803. The Z value was 5.884, with a p value of 0.000. The meta-analysis results clearly showed a significantly positive correlation between teachers' organizational commitment and job satisfaction.

Collectively, the interrelationships among the three variables in the educational domain exhibit moderate to high effects. The research findings support H1, H2, and H3, indicating that there were significantly positive correlations between transformational leadership and teachers' job satisfaction, and between transformational leadership and teachers' organizational commitment, and between teachers' organizational commitment and job satisfaction.

Teachers' organizational commitment Mediates the Relationship between Transformational Leadership and Job Satisfaction

The results of the structural equation model revealed that the direct effect estimate of transformational leadership on teachers' job satisfaction was 0.365 ($p <$ .001), demonstrating that transformational leadership directly and positively predicts job satisfaction in a significant manner. In addition, the direct effect of transformational leadership on teachers' Organizational Commitment was 0.646 ($p <$ .001), while the direct effect of teachers' organizational commitment on job satisfaction was 0.548 ($p <$ .001), implying that teachers' organizational commitment not only received a positive influence from transformational leadership but also directly and positively affected job satisfaction. Importantly, transformational leadership exerted a significantly indirect effect on job satisfaction through Teachers' organizational commitment, with an estimate of 0.354 ($p <$ 0.001), further enhancing job satisfaction. The total effect of these direct and indirect effects in the model was 0.719 ($p <$ .001), confirming that the mediating role of Teachers' organizational commitment was not only significant but also substantial. Based on the set findings, the research results supported H4: Teachers' organizational commitment mediates the relationship between transformational leadership and job satisfaction.

Given these findings, it becomes clear that school administrators must recognize the key role of transformational leadership in fostering teachers' job satisfaction. Transformational leadership positively affects not only teachers' job satisfaction directly but also through enhancing their organizational commitment. Therefore, school leaders should implement teacher-centered transformational leadership strategies that strengthen teachers' emotional identification with the organization and increase their organizational commitment. This, in turn, boosts teachers' motivation and job satisfaction. Moreover, by focusing on personalized care, motivation, and professional development support, school management can further align teachers with the school's goals and values, improving their performance and reducing turnover rates. Consequently, educational policymakers and administrators should view transformational leadership as a critical strategic tool for advancing school reform and teacher development, ultimately contributing to a more supportive and innovative school organizational culture.

Research Limitations and Recommendations for Future Research

The present study primarily extracted journal articles and dissertations as information sources, aiming to utilize the complete data for meta-analysis. Journal articles were selected for their rigorous peer-review process, ensuring the reliability of the information, while dissertations provided more detailed reports of data and results.

While the current study has provided insights into the overall positive correlations among the three variables, Future research may consider disaggregating transformational leadership, Teachers' organizational commitment, and job satisfaction into more detailed sub-dimensions.

After breaking down the variables into sub-dimensions, researchers should measure and analyze the correlation coefficients among these dimensions to further reveal the dynamic relationships within each dimension. This approach can help pinpoint which specific leadership behaviors are most effective in enhancing Teachers' organizational commitment and job satisfaction.

In terms of research methodology, future studies could consider the use of mixed research methods, such as combining quantitative and qualitative approaches, By adopting the above recommendations, future research can advance our understanding of the nuanced relationships among transformational leadership, Teachers' organizational commitment, and job satisfaction, leading to more effective strategies for enhancing teachers' well-being and organizational effectiveness in educational settings.

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Productive disposition in mathematical problem solving of STEM students and its correlation to their mathematical achievement

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Abstract

The Philippines continues to struggle with low performance in Mathematics, as indicated by the latest findings from the 2022 Program for International Student Assessment (PISA). Despite efforts to implement reforms following disappointing results in 2018, less than a quarter of Filipino students reached the minimum proficiency level in Mathematics. The country's scores remain below the global average, with only 16 percent of students achieving basic proficiency in math. Despite ongoing reforms, the Philippines faces a significant challenge in improving student performance on a global scale. As a result, the main objective of this study is to improve the academic achievement of the students, particularly in Mathematics. The researcher used an explanatory sequential design, combining quantitative and qualitative methods to achieve comprehensive results. This approach involves analyzing quantitative data first, followed by qualitative insights to deepen understanding of the problem. The quantitative analysis revealed a non-significant correlation between productive disposition and mathematical achievement, challenging the presumption of a direct relationship between these variables. This suggests that factors beyond productive disposition alone influence academic performance in mathematics. To explore this further, qualitative analysis was conducted, identifying five key factors contributing to positive productive disposition: resilience, empowerment, relevance, adaptability, and ingenuity. These attributes collectively enhance students' success in learning mathematics. Additionally, participants perceived a significant impact of positive productive disposition on various aspects of mathematical learning, including enjoyment, persistence, performance, confidence, and relevance. This highlights the importance of fostering a positive disposition alongside developing knowledge and skills for substantial achievement in mathematics.

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Introduction

Many students find their study of Mathematics more challenging than other subjects. Research shows that the majority of students view Mathematics as their least favorite subject. Mahanta (2019) asserts that hard work and perseverance are essential for learning and understanding Mathematics, as it is not something that can be mastered easily or immediately. Despite its difficulty, Mathematics remains a critical component of curricula worldwide, valued not only in education but also in numerous areas of life and various careers.

The Philippines has consistently ranked poorly in international mathematics assessments. In the 2018 PISA (Programme for International Student Assessment), Filipino students had the lowest math scores among participating countries, with over half showing very low competency. The 2019 TIMSS also ranked the Philippines last among 58 countries. Despite educational reforms and the introduction of the K to 12 curriculum to improve problem-solving skills, the 2022 PISA showed minimal improvement, with only 16 percent of students reaching basic proficiency, leaving the country among the lowest of 81 participants.

Awofala (2020) suggests that low student performance in mathematics stems from teaching fundamentals separately from conceptual knowledge. The National Research Council (2001) outlines five strands of mathematical proficiency, with productive disposition—students' attitudes toward math—often overlooked. Abidin (2021) stresses the importance of developing productive disposition early, as it significantly influences students' performance.

As a result, the main objective of this study is to improve students' academic achievement in Mathematics by examining the relationship between productive disposition and mathematical performance. The unique contribution of this study lies in addressing the gap in research on the role of productive disposition in mathematical achievement, particularly among STEM students. Unlike prior studies that primarily focus on cognitive aspects, this research emphasizes the significance of attitudes and emotions in Mathematics learning. Additionally, the study seeks to explore how productive disposition in mathematical problem-solving influences achievement and to provide new insights into strategies that could enhance students' mathematical proficiency, potentially informing more effective educational practices and interventions. Specifically, the study sought answers to the following: (1) Quantitative analysis include: (1.1) How may the level of STEM students' productive disposition in mathematical problem solving be described in terms of: a) affect, b) beliefs; c) goals, d) identify; e) mathematical integrity, f) motivation, g) risk-taking; and h) self-efficacy? (1.2) How may the mathematical achievement of STEM students be described in terms of the result of the achievement examination? and (1.3) How significant is the relationship between STEM students' productive disposition and achievement in Mathematics?

(2) Qualitative analysis includes: (2.1) Central question, How may the key informants describe their perception of the association between their positive productive disposition and mathematics performance? And (2.2) Probing questions, (a) What is the importance of having a positive productive disposition?, and b) Do you think your positive productive disposition has something to do with your mathematical performance?

(3) Implication of the study, What educational program may be drawn from the findings of the study that will lead the researcher to propose a comprehensive strategy aimed at improving the students' mathematical achievement through productive disposition?

Literature Review

Mathematics is a fundamental subject that underpins the fields of science, technology, and engineering. Consequently, achieving a high level of proficiency in mathematics is essential for students to navigate future challenges effectively. To understand the factors that contribute to students' mathematical achievement, this literature review draws upon Bandura's self-efficacy theory (Clemente et al, 2024), which asserts that students' belief in their ability to perform specific tasks significantly impacts their success. Additionally, McLeod's theory (Ocal, 2021) on attitudes and beliefs in mathematics education provides a framework for examining how affective factors, such as productive disposition, influence students' attitudes and performance in mathematics. This theoretical perspective will guide the exploration of positive dispositions toward mathematics and contribute to enhancing students' overall achievement in the subject.

Productive Disposition

Productive disposition is defined as "the propensity to view Mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own

efficacy" (NRC, 2001, p. 131). Hlaing and Thein (2020) describe it as students' inclination and feelings towards Mathematics, emphasizing that it encourages viewing the subject not as mere memorization but as a system of interconnected concepts that can be mastered through perseverance and eagerness to learn (Awofala, 2020). In mathematical problem-solving, productive disposition encompasses students' ability to develop, evaluate, and operate their mathematical thinking processes (Awofala, 2017). This aspect of mathematical proficiency highlights the importance of nurturing students' capabilities not only to solve problems but also to effectively communicate their solutions in real life. In this study, productive disposition is defined as students' positive inclination towards Mathematics, reflecting their view of it as useful, logical, and beneficial.

Mathematical Problem-Solving

Problem solving is essential in mathematics education, involving high-level cognitive processes and strategies like Polya's four-step approach (Liljedahl & Cai, 2021; Simamora, Saragih, & Hasratuddin, 2018). Common strategies include drawing and arithmetic operations, with problem-solving methods often outperforming scientific approaches in enhancing skills (Zukaldi, 2021; Tambunan, 2019). Factors like mathematics anxiety and difficulties with word problems can hinder students' abilities, but approaches like Realistic Mathematics Education have shown positive impacts on achievement (Rusyda et al., 2021; Verschaffel et al., 2020).

Mathematical Achievement

Mathematical achievement is considered one of the learning abilities which reflects the result of what students learn in mathematics, additionally, it serves as a gauge of how well-effective and well-efficient a certain teaching technique or strategy is at enhancing and advancing the students' understanding of Mathematics (Jawad & Majeed, 2021). Maamin, (2020) also emphasized that mathematical achievement is vital for students' ongoing education and future employment opportunities. Strong mathematical skills indicate a country's proficiency in science, technology, and engineering, as mathematics serves as a foundational element in these fields. Furthermore, in today's globalized world, the ability to effectively apply mathematical knowledge in practical situations has become increasingly important for maintaining competitiveness.

Based on the extensive review of the literature of this study, it is essential to identify the prevalent characteristics that have a significant impact on students' performance, particularly in Mathematics. The gap in understanding the relationship between productive disposition and mathematical achievement among STEM students highlights the need for further investigation into the specific factors that contribute to this connection to inform effective practices and enhance student performance in Mathematics. Despite the different recommendations from the previous studies, this matter is still unsolved and suggestions are still limited. In other words, this issue needs more attention internationally and locally so that we can help the students in becoming globally competitive.

Methodology

The researcher employed an explanatory sequential design, first analyzing quantitative data before integrating qualitative insights for a comprehensive understanding. Participants for interviews were selected based on initial quantitative findings to explore research issues holistically. Correlational research linked participants' problem-solving disposition to their mathematical achievement, followed by in-depth interviews that complemented the quantitative results. Thematic analysis further enriched the understanding gained from the quantitative data.

Participants

The study involved Grade 12 STEM students from a private institution in City of Malolos, Bulacan. This school was chosen for its accessibility, student population, and the researcher's familiarity with the institution, aiming to explore the relationship between productive disposition in mathematical problem solving and mathematical achievement among STEM students.

Participant 1

Quantitative Phase: The study involved all 1,049 Grade 12 STEM students, and the researcher employed universal sampling to ensure the utmost accuracy of the data. This approach minimized sampling bias and enhanced the reliability and validity of the findings, aiming to provide meaningful insights into the relationship between productive disposition in mathematical problem solving and mathematical achievement among STEM students.

Participant 2

Qualitative Phase: The study used purposive sampling to select three participants from each of 20 sections, following Creswell's guidelines, which emphasize smaller and focused samples for in-depth exploration. This method allowed for the inclusion of individuals with valuable insights and relevant experiences. Criteria for selection included involvement in the subject matter, willingness to participate, and availability. Semi-structured interviews were conducted to gather detailed perspectives, with confidentiality and anonymity assured. This approach aimed to capture a comprehensive range of viewpoints to enrich the understanding of the study's focus.

Data Collection

Data gathering was done in three (3) phases: (1) Pilot Testing Procedure, (2) Mathematical Achievement Test and Mathematical Productive Disposition Assessment, and (3) Interview.

Pilot Testing Procedure: The pilot testing of the 40-item Mathematical Achievement Test was validated by three experts in mathematics education to ensure content validity. A representative sample of Grade 12 STEM students was selected, and the test was administered with approval from the school's Principal.

Mathematical Achievement Test and Mathematical Productive Disposition Assessment: Data were collected using a Likert Scale survey and achievement tests to measure STEM students' mathematical achievement and productive disposition. Approval was obtained from the Research Ethics Committee, the Principal, and Grade 12 advisers. Surveys were distributed to STEM classes, and results were analyzed for productive disposition. Achievement test results were reviewed for proficiency, and the data were then evaluated by a statistician.

Interview Procedure: Interviews provided valuable insights into participants' experiences. Approval was obtained from the Principal and advisers, and students were informed about their participation. A pre-session briefing established rapport and clarified expectations. Participants were given study details and signed consent forms to ensure confidentiality. Afterward, interviews were transcribed and analyzed manually for patterns and themes, ensuring coding consistency for reliable findings.

Data Analysis

Quantitative Phase: The study used a 24-item questionnaire by Jill M. Siegfried (2012) to measure productive disposition, rated on a 4-point Likert scale across eight factors: affect, beliefs, goals, identity, mathematical integrity, motivation, risk-taking, and self-efficacy. Reliability, confirmed by Cronbach's alpha (0.74 to 0.88), ensured the scale's validity. A 40-item mathematical achievement test was also developed and revised with expert input for reliability, achieving a Kuder-Richardson (KR-20) coefficient of 0.802. Data from the surveys were analyzed using SPSS Version 21, employing frequency counts, means, and Spearman's rho correlation to compare productive disposition with mathematical achievement at a significance level of 0.05.

Qualitative Phase: Data were collected through interviews and a Focused Group Discussion (FGD) to capture participants' insights. The interviews were transcribed, organized, and analyzed using thematic analysis, identifying recurring themes and patterns through systematic coding. These themes were synthesized into an eidetic model, visually representing their essence and interrelationships, thus providing a structured framework for understanding the phenomena. The researcher ensured rigor by adhering to established methodologies and accurately reflecting participants' perspectives throughout the analysis.

Results and Discussion

Productive Disposition:

As shown in Table 1, the mean scores of Grade 12 students across eight factors of productive disposition reveal a generally positive attitude towards mathematics, with an overall average score of 2.89, indicating an "Agree" disposition. Notably, Mathematical Integrity (3.25) received the highest score, followed by Identity (3.08), Goals (3.05), and Motivation (3.06), suggesting that students prioritize integrity in their mathematical work, identify with the subject, set related goals, and are motivated to engage with mathematical concepts.

Table 1 Eight Factors of Production Disposition

Domains	*SD*	*M*	Interpretation
1. Affect	0.87331	2.64	Agree
2. Beliefs	0.80479	2.66	Agree
3. Identity	0.70036	3.08	Agree
4. Mathematical Integrity	0.70791	3.25	Agree
5. Risk-taking	0.77874	2.88	Agree
6. Goal	0.76827	3.05	Agree
7. Motivation	0.76709	3.06	Agree
8. Self-efficacy	0.86874	2.46	Agree
Overall Average		2.89	Agree

However, the lower score in Self-efficacy (2.46) indicates that students may have reservations about their ability to perform well in mathematics, highlighting the need for interventions to boost self-efficacy. Other factors such as Affect (2.64), Beliefs (2.66), and Risk-taking (2.88) scored around the overall average, indicating moderate agreement and potential areas for improvement. Lastly, the relatively moderate standard deviations suggest that while there is some diversity in students' productive dispositions toward mathematics, the responses are not extremely dispersed. This consistency, particularly in factors like Identity and Mathematical Integrity, reflects shared attitudes, but factors with higher variability like Affect and Self-efficacy indicate areas where students' experiences and perceptions differ more widely. These findings align with Awofala (2017), who identified mathematical integrity as the strongest predictor of performance, followed by identity, risk-taking, goals, and beliefs, with self-efficacy being the least significant. In contrast, Awofala (2020) found that six out of eight predictors, including self-efficacy, identity, mathematical integrity, goals, beliefs, and risk-taking, significantly contributed to mathematical achievement, while affect and motivation did not. These insights highlight the need to address self-efficacy and other moderate factors to enhance Grade 12 students' mathematical disposition, performance, and engagement.

Mathematical Achievement:

Table 2 shows the mathematical achievement of Grade 12 STEM students in Calculus, with percentages ranging from 37.23 to 56.00 percent. While most groups fall under the "Progressing" category, variations among STEM groups highlight the need for targeted support and intervention. Strategies to improve students' math abilities include focusing on weaknesses, empowering self-assessment, enhancing teaching methods, and providing timely feedback. Overall, while students demonstrate a basic understanding of Calculus, tailored strategies are necessary to address varying learning needs and provide a supportive learning environment.

Correlation: Productive Disposition in Mathematical Problem-Solving and Mathematical Achievement

Table 3 investigates the correlation between productive disposition and mathematical achievement, utilizing Spearman's rank correlation coefficient due to non-normal distributions in both variables. The correlation coefficient obtained is -0.046, signifying a non-significant relationship between productive disposition and mathematical achievement. The significance level of 0.150 (>0.05) supports the idea that there is no correlation between these variables. However, other research suggests that productive disposition has a direct influence on academic performance (Ramdani et al., 2021). This relationship has been studied in various educational contexts, such as its correlation with students' mathematical achievement in Nigeria (Awofala, 2020).

The lack of a significant correlation between productive disposition and mathematical achievement, as indicated by the quantitative analysis, may suggest that other factors beyond disposition alone contribute to academic performance in mathematics. This finding is significant as it challenges conventional assumptions about the direct connection between positive productive disposition and performance in mathematics. The qualitative analysis aims to explore the underlying factors influencing productive disposition and its impact on mathematical achievement by investigating students' subjective experiences and perceptions, addressing discrepancies between quantitative findings and prevailing beliefs.

Table 2 The Mathematical Achievement of STEM Students

Grade & Section	Percentage	Interpretation
12 – STEM 1	47.71	Progressing
12 – STEM 2	50.61	Progressing
12 – STEM 3	52.31	Progressing
12 – STEM 4	55.17	Progressing
12 – STEM 5	56.00	Progressing
12 – STEM 6	53.13	Progressing
12 – STEM 7	50.56	Progressing
12 – STEM 8	42.15	Progressing
12 – STEM 9	48.91	Progressing
12 – STEM 10	48.16	Progressing
12 – STEM 11	45.40	Progressing
12 – STEM 12	49.27	Progressing
12 – STEM 13	48.03	Progressing
12 – STEM 14	38.44	Progressing
12 – STEM 15	37.23	Progressing
12 – STEM 16	45.23	Progressing
12 – STEM 17	46.53	Progressing
12 – STEM 18	42.99	Progressing
12 – STEM 19	45.47	Progressing
12 – STEM 20	44.29	Progressing
Overall Percentage	47.38	Progressing

Table 3 Correlation Between the Productive Disposition in Mathematical Problem Solving & Mathematical Achievement

Variables	Correlation Coefficient	*p* (2-tailed)
Productive Disposition Mathematical Achievement	-0.046	0.150

Perception of Positive Productive Disposition and Mathematical Performance:

Productive disposition refers to an individual's inclination to perceive value in a particular domain and to engage in purposeful and effective actions within that domain. In the context of education, productive disposition is considered a crucial component of proficiency in various subjects, including mathematics (Lynch-Arroyo et al., 2023).

This section examines the significance of having positive productive disposition and its relationship with students' mathematical performance and achievement.

Table 4 presents a clear picture of how a positive productive disposition significantly impacts the learning experience of Grade 12 STEM students. Based on the thematic analysis of the interview data, it unveils five (5) key factors that contribute to the positive productive disposition of Grade 12 STEM students towards mathematics. The analysis emphasizes subthemes such as resilience, empowerment, relevance, adaptability, and ingenuity, all of which wield significant influence in shaping students' attitudes and behaviors towards learning mathematics; Resilience is essential for overcoming mathematical challenges, involving perseverance through difficulties and learning from mistakes while staying motivated. Empowerment boosts students' success and self-esteem by fostering confidence and motivation in their mathematical abilities. Relevance enhances learning by linking mathematical concepts to real-life scenarios, making the subject more engaging and purposeful. Adaptability provides students with a growth mindset and the flexibility to approach complex problems confidently and creatively. Ingenuity drives excellence in STEM by encouraging creative thinking and innovative solutions, allowing students to thrive in environments that value such skills. Based on the study conducted by Fadillah and Wahyudin (2020), students with positive productive dispositions were able to effectively apply problem-solving strategies, while those with moderate dispositions struggled, and students with low dispositions had difficulty understanding the problems. These findings support the results of this study, highlighting the critical role of a positive productive disposition in mathematical achievement. Having a strong productive disposition not only enhances problem-solving abilities but also fosters a deeper understanding of mathematical concepts, ultimately leading to improved academic performance, particularly in Mathematics. In conclusion, maintaining a positive productive disposition is essential for success in the field of Mathematics. Educators can unlock a powerful tool for academic success, particularly in Mathematics. By cultivating resilience, empowerment, recognizing relevance, fostering adaptability, and encouraging ingenuity, students can enhance their understanding of different mathematical concepts, improve their problem-solving skills, and attain educational excellence. Furthermore, educators can create a learning environment that fosters engagement, promotes understanding, and equips students with the skills and confidence needed to excel in STEM fields. However, it is also acknowledged that a positive disposition should be coupled with actual knowledge and skills to achieve substantial success in mathematical achievement.

Table 4 Importance of Having a Positive Productive Disposition

Meaning Units	Condensed Meaning Units	Subthemes	Themes
2, 3, 8, 9, 14, 20, 24, 28, 35, 41, 51, 55	A positive outlook on mathematics helps students view it as less daunting and more approachable, fostering optimism towards learning and problem-solving.	Resilience: Overcoming Challenges with Persistence and Growth	Factors That Contribute to Positive Productive Disposition of Grade 12 STEM Students
12, 17, 25, 32, 33, 40, 42, 43, 46, 58	A positive disposition encourages students to persist through challenges, seek help when needed, and explore alternative learning strategies.		
3, 12, 17, 25, 32, 33, 42, 43, 46, 58	A positive productive disposition fosters resilience by encouraging students to persevere through difficulties, overcome setbacks, and maintain a proactive attitude towards learning.		
1, 4, 10, 22, 26, 37, 54, 57, 59, 60	Having a positive productive disposition serves as a motivator for students to engage actively in learning mathematics.	Empowerment: Confidence and Motivation in Solving Mathematical Problem	

Table 4 Continued

Meaning Units	Condensed Meaning Units	Subthemes	Themes
9, 15, 19, 23, 27, 31, 38, 49	This productive disposition contributes significantly to academic performance by instilling confidence, improving problem-solving skills, and enhancing understanding.		
4, 10, 18, 24, 28, 35, 41, 48, 51, 59	By promoting a growth mindset and a willingness to learn from mistakes, a positive disposition facilitates continuous improvement and mastery of mathematical concepts.		
1, 9, 22, 26, 37, 54, 55, 57, 60	It instills confidence in students' abilities to tackle mathematical challenges, leading to greater self-assurance and belief in their capacity to succeed.		
5, 6, 11, 16, 18, 30, 36, 44, 48, 52, 56	A positive attitude towards mathematics extends beyond academics, facilitating its application in real-life scenarios and promoting its relevance in everyday situations.	Relevance: Seeing Mathematics as Practical and Meaningful in Real-life Context	
3, 15, 19, 23, 27, 31, 37, 49	It leads to more effective learning outcomes by fostering resilience, adaptability, and a proactive approach to problem-solving.	Adaptability: Flexible Thinking for Diverse Problem-Solving	
7, 13, 21, 29, 34, 39, 45, 47, 50, 53	It enhances problem-solving abilities, critical thinking, and logical reasoning, thereby enriching students' overall learning experience.	Ingenuity: Creativity and Innovation in Mathematical Exploration	

Table 5 shows that a positive disposition towards mathematics has a significant impact on various aspects of learning and performing mathematics. Key themes that include enjoyment, persistence, performance, confidence, and relevance are being explored; Enjoyment in learning mathematics makes the experience more engaging and less stressful, promoting enthusiasm for the subject. Persistence helps students remain motivated and view challenges as growth opportunities, driven by a positive productive disposition. This positive disposition enhances performance by fostering interest, confidence, and a constructive mindset. Confidence is strengthened through a positive disposition, enabling students to tackle complex problems and persist despite uncertainties. Moreover, a productive disposition broadens students' perspectives on mathematics, encouraging them to link mathematical concepts with real-life applications, thereby increasing the relevance of the subject.

Similarly, Kusmaryono et.al. (2019) revealed a strong relationship between mathematical disposition and mathematical achievement. The result of the study showed that using mathematical knowledge in non-routine problems through reasoning, communication, and connections provides self-confidence and productive dispositions, which in turn strengthens mathematical power. Both studies emphasize the importance of a productive disposition in enhancing student engagement and problem-solving abilities. While the current study highlights the broad impact of a positive disposition on various learning aspects, Kusmaryono also highlights the role of disposition in building mathematical achievement and calls for teachers to monitor and sustain this disposition. The findings from both studies reinforce the need for fostering productive dispositions to improve mathematical learning and performance. In summary, this analysis provides strong evidence that cultivating a positive disposition towards mathematics can significantly enhance the learning experience and lead to better mathematical achievement. These themes collectively demonstrate the advantages and benefits of maintaining a positive productive disposition in Mathematics among STEM students. The researcher analyzed the subthemes of enjoyment, persistence, performance, confidence, and relevance to identify the overarching theme of expected outcomes on having a positive productive disposition. This thematic analysis highlights the transformative power of positive productive disposition in mathematics, shaping not only students' attitudes and behaviors but also their academic success and real-world problem-solving abilities.

Table 5 Relationship of Positive Production Disposition and Mathematical Performance

Meaning Units	Condensed Meaning Units	Subthemes	Themes
2, 26, 36, 40, 51, 59	Positive disposition contributes to finding math more enjoyable and less stressful, making learning math a more positive experience.	Enjoyment: Enhancing the Enthusiasm of Learning Mathematics	Expected Outcomes on Having Positive Productive Disposition
9, 13, 21, 29, 43, 47, 56	Positive productive disposition creates a more enjoyable and fun approach to learning math, enhancing the overall learning experience.		
3, 27, 31, 37, 57	A positive disposition helps in persistently finding answers and staying motivated in answering math equations.	Persistence: Fostering Resilient in Problem-Solving	
1, 34, 41, 52, 53, 58	Positive disposition enhances motivation, making it easier to tackle complex problems and persist in learning math.		
4, 8, 14, 17, 18, 19, 20, 22, 23, 24, 25, 30, 33, 35, 38, 42, 44, 45, 46, 48, 49, 50, 54, 55	Positive disposition leads to better performance in math by fostering interest, confidence, and a positive outlook.	Performance: Improving Mathematical Achievement	
6, 11, 28, 32, 39	Positive disposition fosters interest and turns weaknesses into strengths, encouraging the challenge of solving more math problems and enhancing problem-solving abilities.		
7, 10, 16, 31, 41, 56, 58, 59	Positive disposition changes mindset, making it easier to analyze problems, find solutions, and view math as worthwhile and enjoyable.		
5, 12, 47, 60	Positive disposition boosts self-confidence in approaching mathematical tasks and contributes to better mathematical performance.	Confidence: Boosting Self-Confidence in Mathematics	
27, 35, 40, 49, 52	Positive disposition helps understand how math is applicable in everyday life, providing a broader view of its importance and enhancing mathematical skills.	Relevance: Recognizing Math's Real-Life Importance	
9, 32	Positive disposition enables realization of the essence and importance of math, leading to motivation, progress, and a deeper understanding of mathematical concepts.		

From Qualitative Analysis to Eidetic Model Approach

Based on the interview results, the Eidetic Model (in Figure 1) provides a comprehensive framework for promoting positive productive disposition in students, highlighting five key contributing factors: Resilience, Empowerment, Relevance, Adaptability, and Ingenuity. These factors interact synergistically, shaping students' experiences in Mathematics and fostering holistic development and success. The model also illustrates how these elements are interconnected, represented by a knot that symbolizes the strong relationship between the factors and the expected outcomes. These outcomes—Enjoyment, Persistence, Performance, Confidence, and Relevance—are directly influenced by the positive productive disposition cultivated through the interaction of these key factors.

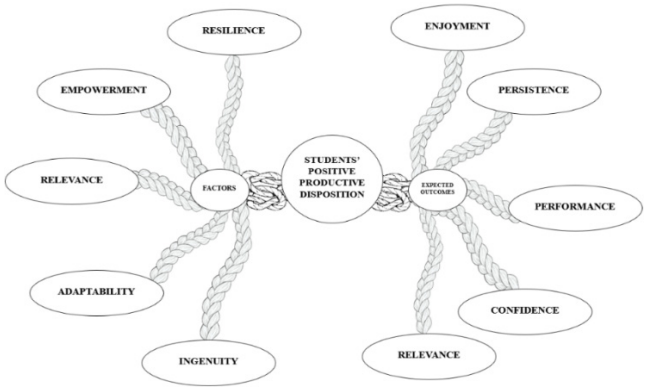

Figure 1 Interwoven Success: Essential Mathematical Knots for Cultivating Productivity and Achieving Positive Outcomes

In summary, the Eidetic Model is a useful framework for understanding the factors that contribute to a positive productive disposition in students. The model can be used by educators to develop instructional strategies that promote these factors and help students achieve positive outcomes in mathematics.

Educational Program Drawn from The Findings of the Study

This study identifies five key components of a positive productive disposition—Resilience, Empowerment, Relevance, Adaptability, and Ingenuity—and outlines how these factors contribute to the development of students' mathematical success. As shown in Figure 2, various activities and techniques can be employed to enhance these factors, such as challenge-based learning, workshops, real-world applications, and adaptive learning strategies. These methods are strategically aligned with each factor to maximize the desired outcomes. Moreover, Figure 2 visually represents how these techniques, when integrated into educational programs, can lead to the five key outcomes: Enjoyment, Persistence, Performance, Confidence, and Relevance, thereby enhancing students' overall academic achievement. These programs are:

1. Resilience Enhancement Program: Develops perseverance and motivation through workshops, challenge-based learning, and mentorship, helping students manage stress and learn from setbacks to boost persistence, confidence, and performance in mathematics.

2. Empowerment Initiative Program: Increases student confidence and motivation via leadership opportunities, self-efficacy workshops, and a feedback system to celebrate achievements, enhancing confidence, persistence, and enjoyment of mathematics.

3. Relevance Integration Program: Connects mathematical concepts to real-life applications through practical projects and career exploration, improving students' appreciation, enjoyment, and performance by demonstrating the real-world value of mathematics.

4. Adaptability Development Program: Promotes a growth mindset and flexible problem-solving with adaptive learning modules and varied strategies, aiming to improve flexibility, confidence, and engagement with complex mathematical tasks.

5. Ingenuity Promotion Program: Encourages creative problem-solving through innovation challenges and project-based learning, enhancing ingenuity, performance, and confidence by fostering novel applications of mathematical concepts.

Integrating these components into the curriculum not only addresses identified areas for improvement but also empowers students to succeed academically and personally. This approach reflects a commitment to provide a culture of mathematical excellence and equip students with essential skills for future success in their academic and professional endeavors.

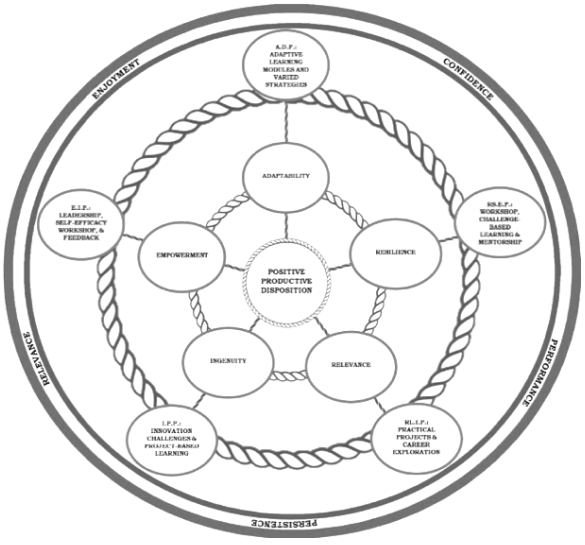

Figure 2 Positive Productive Disposition: Programs for Building Resilience, Empowerment, Relevance, Adaptability, and Ingenuity to Boost Student Success

Conclusion and Recommendations

Based on the findings of the study, the following conclusions were drawn:

1. The study emphasizes the importance of addressing Self-efficacy and fostering a positive affective domain to enhance students' overall mathematical disposition, guiding interventions for administrators and educators.

2. The data highlight Grade 12 students' overall positive progress in Calculus, yet the variability among STEM groups underscores the need for tailored strategies to create an inclusive and supportive learning environment, ensuring all students receive necessary support for mathematical achievement.

3. The results reveal a lack of significant correlation between productive disposition and mathematical achievement, prompting further exploration into the complexity of productive disposition to gain valuable insights for educators and researchers.

4. Interview findings identify resilience, empowerment, relevance, adaptability, and ingenuity as key factors contributing to Grade 12 students' productive disposition, enhancing motivation, problem-solving, and creativity crucial for academic success.

5. Cultivating a positive disposition towards mathematics, characterized by enjoyment, persistence, performance, confidence, and relevance, can significantly enhance the learning experience and lead to better mathematical achievement.

6. Educational programs that cultivate a productive disposition in students, addressing all five key components identified in the study, can lead to improved mathematical achievement, empowering students to succeed both academically and personally.

Based on the conclusion of the study, the researcher has suggested some recommendations for addressing the challenges identified:

1. Teachers should identify individual students' strengths and weaknesses in Calculus and tailor interventions such as additional practice sessions, differentiated instruction, or specialized tutoring to address their specific needs.

2. Integrating real-life applications into mathematics activities can provide meaningful learning experiences and deepen students' understanding of mathematical concepts, fostering a productive disposition towards the subject.

3. Mathematics teachers can enhance engagement by incorporating games, puzzles, and activities into lessons, connecting mathematical concepts to students' hobbies and interests to demonstrate real-world applications.

4. Administrators can support teachers by providing orientation, training, and seminars on productive disposition in mathematics, enabling teachers to integrate and contextualize it into their lessons and activities effectively.

5. Future research could explore additional factors influencing the relationship between productive disposition and mathematical achievement, while also encouraging continuous improvement of research methodology.

Conflict of Interest

The author declares that there is no conflict of interest.

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Path analysis of factors influencing identity in graduates from the Faculty of Forestry, Kasetsart University

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Abstract

This study investigates the factors influencing identity development among 710 graduates from Kasetsart University's Faculty of Forestry. Using path analysis, the research identifies integrity, commitment, knowledge application, and adaptability as significant predictors of graduate identity. The findings suggest that teamwork and fighting spirit are dependent variables, predicted at 60 percent and 48 percent, respectively. These results have practical implications for curriculum development and skill enhancement initiatives aimed at maintaining graduate identity and meeting societal expectations.

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Introduction

Faculty of Forestry at Kasetsart University is regarded as the only higher education institution in Thailand that offers teaching and learning in the forestry field at all levels, and is considered the leading educational institution that prepares graduates to work in forestry and national parks, producing wildlife and plant species. Therefore, the Faculty of Forestry has an intensive teaching and learning management model, especially with regard to field work. In addition, complementary activities are organized to develop important career skills, aiming to provide students with a number of competencies related to the demands of the job. According to the research findings on the identity of forestry graduates (Diloksumpun et al., 2023), forestry graduates have nine prominent identity characteristics, including teamwork, motivation, and knowledge practice. They adhere to morality towards themselves and others and try to adapt to the environment, are polite and humble, proactively help and share. They do not appear condescending or combative. However, it is still necessary to consider how the various identities that have emerged among forestry graduates directly and indirectly affect each other. How can the guidelines of education management development for human development be utilized to produce graduates with the expected identities?

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Path analysis is a widely utilized statistical method for exploring direct and indirect variable relationships to ascertain causal connections among independent variables. Cuadra-Martinez et al. (2019) conducted a path analysis on predictors of professional identity in psychology students. Strate et al. (2023) examined university students' occupational identity through pathways influenced by attachment, gender, age, and socioeconomic status, primarily occurring in peer interactions. The significance of peer support in identity formation is highlighted by Wingwon (2015), who found that self-perception directly affects identity, with social support shaping this perception. Family and institutional support also directly influence the perception of one's abilities. The study by Ditphokinsakul and Langka (2018) revealed that teachers' professional identity is positively affected by their self-efficacy and teaching spirit, with social transmission playing an indirect role. Together, these causal factors account for 76 percent of the variance in teachers' professional identity, indicating a need for enhanced identity education in forestry and agriculture professions.

This study aims to investigate the direct and indirect impact of identity on forestry graduates, who are considered professionals who require a unique identity, especially as fighters and team workers, by applying path analysis. Preliminary results show that there are still few students studying path analysis in the forestry field. In contrast to current educational management, the emphasis is on presenting results as preliminary values. The results of this study are expected to serve as basic information for the design and development of learning management processes in class activities and extracurricular activities, including the creation of an environment that promotes learning. Not only does it show the sequential steps of identity development, but it also highlights the points that need to be considered during the development, which can not only help forestry departments to develop graduates who can maintain their identity, but also be applied to the design and development of learning management models in other courses and performance characteristics in the future as well.

Literature Review

The identity of graduates from the Faculty of Forestry, Kasetsart University is shaped by various factors that affect educational experience and professional development to help solve problems in an era of increasing environmental concerns. The forestry sector therefore becomes increasingly important and emphasizes the need to have a strong educational foundation in the field of forestry and related fields. (Blake, 2024; Wilson, 2023) These programs aim to equip learners with the skills necessary for effective management and conservation of forest resources. When graduates embark on their career paths, these educational foundations, coupled with expert learning, can increase their ability to enter the labor market and increase their performance in their career field (Blake, 2024).

Factors that affect identity: The development of professional identity of graduates from the Faculty of Forestry, Kasetsart University is influenced by a number of factors, which, based on the results of previous research, have proposed a comprehensive conceptual framework that divides these influences into different groups, which allows for a more integrated understanding of how different elements contribute to professional identity in the context of higher education (Sills, 2009). Types of influencing factors: Social experience, Educational Context, Perception of occupational conformity, Demographic characteristics, Professional image Work Experience, Self-development and self-participation.

There is still a lack of research on the identity of graduates of the Faculty of Forestry, as far as the research team has discovered, especially the graduate development model. With Research and Development of Teaching Curriculum, the development of graduates is in line with the needs of the labor market and the needs of society. The identity of the graduates of the Faculty of Forestry is important; there are 9 variables: (1) Teamwork (Fl), (2) Commitment (F2), (3) Application knowledge (F3), (4) Integrity (F4), (5) Adaptability (F5), (6) Humility (F6), (7) Willingness to help (F7), (8) Not-indifferent (F8), and (9) Fighting spirit (F9) (Diloksumpun et al., 2023). But previous findings still need to be studied at the level of relationships, the magnitude of influence and the causality of identity variables This study helps to expand the knowledge to understand the cause and effect of these variables even more.

Methodology

Research objectives: To study the Path Analysis of Factors Influencing Identity in Graduates from the Faculty of Forestry, Kasetsart University

Research hypothesis: The paths of identity factors of graduates from the Faculty of Forestry, Kasetsart University, are consistent with the empirical data.

Participants: The population in this study was graduates from the Faculty of Forestry, Kasetsart University. A random sample of 710 graduates was drawn using multistage sampling.

Data Collection: The research method is quantitative research by analyzing the Structural Equation Modeling (SEM) model using path analysis., accredited based (ICH GCP) and 45CFR 46.l0l(b) from the Research Ethics Committee, Kasetsart University (Aussanasuwannakul & Butsuwan, 2024). Project number KUREC-SS62/134 on 13 August 2020. After that, the authors sent letters to relevant agencies to request assistance in collecting data, which were then analyzed by path analysis.

Research instrument: A questionnaire eliciting the information on development of the identity of graduates from the Faculty of Forestry (Diloksumpun et al., 2023), has been developed by the authors based on qualitative studies and component analysis. It has a total of 9 components, and the questionnaire consists of 45 closed-ended questions, each having 5 opinion levels (Likert Rating Scales) (Albaum, 1997; Joshi et al., 2015). The content validity was examined by 3 experts through the calculation of the index of consistency (IOC), with the IOC value ranging from .60–1.00 and the reliability value of 0.945. From exploratory factor analysis and confirmatory factor analysis, it was found that all the components were consistent with the empirical data.

Conceptual framework: The authors conducted this study based on reviews of previous literature. The predicting equations were found for the identity of graduates from the Faculty of Forestry (Diloksumpun et al., 2023). These findings were used by the authors to create a hypothesis and empirical data in the form of overidentified model of the identity factors of the graduates from the Faculty of Forestry, Kasetsart University (Diloksumpun et al., 2023), as shown in Figure 1.

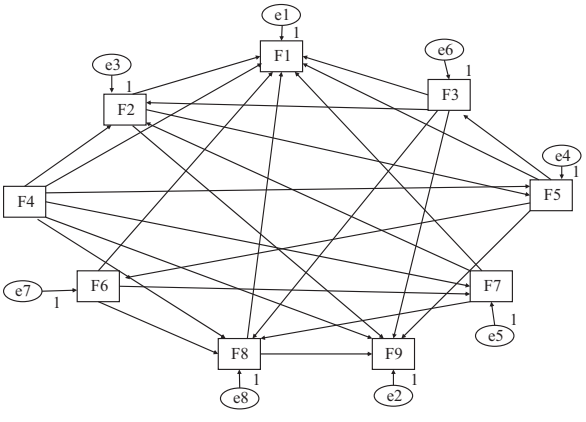

Figure 1 A hypothesis of overidentified model

Data Analysis: Path analysis was employed based on the research assumptions to examine whether the established model was consistent with the actual empirical data.

Results

Results of the measure of model fit: The results were derived from parameter estimation of the model, estimation of various coefficients, and path analysis of an overidentified model of independent variables and dependent variables (latent variables) that the authors have created based on previous research studies. This overidentified model consists of paths connecting variables in various directions that can be linked to dependent variables that are internal variables or latent variables in every structural equation. The statistics shows the relationship between variables through standard regression weights, *t*-Value (critical ratio: C.R.), *p*-Value, and standard error (S.E.). The analysis results are shown in Figure 2.

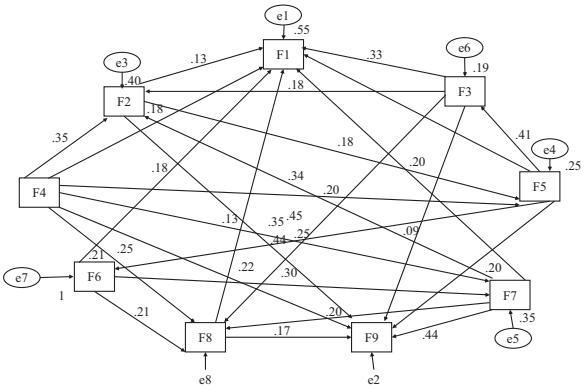

Figure 2 The results of estimation of coefficients of the path analysis model

The model needs to be checked for fitness or consistency of the correlation between variables. If consistent, it can be used for the analysis; if not, the structural equation model needs to be adjusted until it is complete, acceptable and reliable according to the research principles before it can be used. Developing a model that is consistent with empirical data is commonly called "Model Fit." For this study, it was found that the empirical model and theoretical model (prototype model) were not consistent under the evaluation criteria as follows, (1) Chi-square Probability Level: CMIN-p of .000, (2) Relative Chi-square: CMIN/df of 19.582, (3) Goodness of Fit Index: GFI of .932, and (4) Root Mean Square Error of Approximation: RMSEA of.162

The examination of theoretical model (prototype model) fit against the empirical data was found to be inconsistent. The figure shows the estimation of the model parameters or various coefficients indicating the relationship between variables through standard regression weights), standard error (S.E.), *t*-Value (critical ratio: C.R.) and *p*-Value (Luekveerawattana, 2024)

From the path analysis shown in Figure 2 and Table 1, which display standardized regression weights, variables, and indication of statistical significance, it reveals significant correlation of 24 pairs of variables at the 0.001 level ($p < .001$), significant correlation of 1 pair of variables at the .01 level (- $p < .01$), and insignificant correlation of 1 pair of variables at the .05 level.

Since there was one pair of variables with insignificant correlation - fighting spirit being influenced by Adaptability (F9 < --- FS), the researcher had to eliminate this path from the analytical model. Although the model found 24 pairs of variables with significant correlation at the 0.001 level (*** $p < .001$), it was still not consistent with the empirical data. Therefore, the model needed to be adjusted for consistency with the empirical data.

Model Adjustment

From the analysis of the overidentified model of path analysis to find the Factors Influencing Identity in Graduates from the Faculty of Forestry, Kasetsart Universityit, it was found that the correlation between the variables used in the analysis were not appropriate as the model was found inconsistent with the empirical data. Therefore, the model needed to be adjusted based on the value of (1) Chi-square Probability Level: CMIN-p, (2) Relative Chi-square: CMIN/df, (3) Goodness of Fit Index: GFI, and (4) Root Mean Square Error of Approximation: RMSEA to obtain a model with best correlation by adding or discarding statistically significant paths in the overidentified model

Thus, the path coefficients of each structural equation could be used to draw the path of the parsimonious model to ensure the best correlation. The findings are as follows:

Direct effect

1. Integrity had direct effect on teamwork, willingness to help, humility, Integrity, Application knowledge, Adaptability, Commitment, Not-indifferent, and fighting spirit.

2. Willingness to help had direct effect on teamwork, Commitment, Application knowledge, and Not-indifferent.

3. Humility had direct effect on willingness to help, teamwork, Commitment, Application knowledge, and Not-indifferent.

4. Adaptability had direct effect on willingness to help, humility, Application knowledge, and teamwork.

5. Application knowledge had direct effect on Commitment, Not-indifferent, and teamwork.

6. Commitment had direct effect on Adaptability, Not-indifferent, fighting spirit, and teamwork.

7. Not-indifferent had direct effect on fighting spirit and teamwork.

Indirect Effect

1. Integrity had indirect effect on fighting spirit through willingness to help, humility, Adaptability, Application knowledge, Commitment, and Not-indifferent.

2. Integrity had indirect effect on teamwork through willingness to help, humility, Adaptability, Application knowledge, Commitment, and Not-indifferent.

3. Willingness to help had an indirect effect on fighting spirit through humility, Adaptability, Application knowledge, Commitment, and Not-indifferent.

4. Willingness to help had an indirect effect on teamwork through humility, Adaptability, Application knowledge, Commitment, and Not-indifferent.

5. Humility had indirect effect on fighting spirit through willingness to help, Adaptability, Application knowledge, Commitment, and Not-indifferent.

6. Humility had indirect effect on teamwork through willingness to help, Adaptability, Application knowledge, Commitment, and Not-indifferent.

7. Adaptability had indirect effect on fighting spirit through willingness to help, humility, Application knowledge, Commitment, and Not-indifferent.

8. Adaptability had indirect effect on teamwork through willingness to help, humility, Application knowledge, Commitment, and Not-indifferent.

9. Application knowledge had indirect effect on fighting spirit through willingness to help, humility, Adaptability, Commitment, and Not-indifferent.

10. Application knowledge had indirect effect on teamwork through willingness to help, humility, Adaptability, Commitment, and Not-indifferent.

11. Commitment had indirect effect on fighting spirit through willingness to help, humility, Adaptability, Application knowledge, and Not-indifferent.

12. Commitment had indirect effect on teamwork through willingness to help, humility, adaptability, application knowledge, and Not-indifferent. The direct and indirect effect of the graduate identity of the Faculty of Forestry, Kasetsart University appear as shown in the figure below.

Measures of the model fit are used to examine the consistency of correlation between variables. The research results reveal that the empirical model and theoretical model (prototype model) were consistent with empirical data as follows, (1) Chi-square Probability Level: CMIN-p of .348, (2) Relative Chi-square: CMIN/df of 1.118, (3) Goodness of Fit Index: GFI of .998, and (4) Root Mean Square Error of Approximation: RMSEA of .013.

Model path coefficients: From calculation of the direct effect, indirect effect, and the total effect of the adjusted model, it was found that the correlation between the variables was at the highest level. Therefore, the model was used to find direct effect (DE), indirect effect (IE), and total effect (TE).

From Figure 3, regarding total effect, it was found that there were 6 independent variables with a total effect on Willingness to help, namely, Integrity at .565, Willingness to help at .009, humility at .258, Adaptability at .219, Application knowledge at .006, and Commitment at .035.

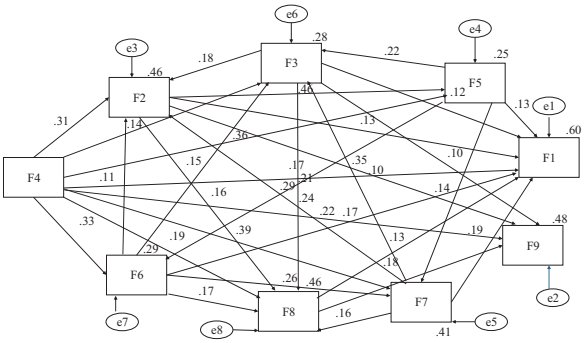

Figure 3 Results of estimating coefficients after model adiustment

There were 6 independent variables with a total effect on humility, namely, Integrity at .462, Willingness to help at .012, humility at .009, Adaptability at .292, Application knowledge at .008, and Commitment at .046.

There were 6 independent variables with a total effect on Adaptability, namely, Integrity at .445, Willingness to help at .044, humility at .033, Adaptability at .022, Application knowledge at .029, and Commitment at .161.

There were 6 independent variables with a total effect on Application knowledge, namely, Integrity at .393, Willingness to help at .164, humility at .201, Adaptability at .302, Application knowledge at .008, and Commitment at .048.

There were 6 independent variables with a total effect on Commitment, namely, Integrity at .568, Willingness to help at .276, humility at .208, Adaptability at .139, Application knowledge at .182, and Commitment at .022.

There were 6 independent variables with a total effect on Not-indifferent, namely, Integrity at .532, Willingness to help at .237, humility at .291, Adaptability at .170, and Application knowledge at .240, and Commitment at .185.

There were 7 independent variables with a total effect on fighting spirit, namely, Integrity at .553, Willingness to help at .157, humility at .146, Adaptability at .110, and Application knowledge at .207, Commitment at .401, and Not-indifferent at .180.

There were 7 independent variables with a total effect on teamwork, namely, Integrity at .604, Willingness to help at .286, humility at .315, Adaptability at .300, Application knowledge at .184, Commitment at .197. and Not-indifferent at .125.

Regarding direct effect, it was found that there were 3 variables with a direct effect on Willingness to help, namely, Integrity at .256, humility at .205, and Adaptability at .126.

There were 2 independent variables with a direct effect on humility, namely, Integrity, at .272 and Adaptability at .310.

There were 2 independent variables with a direct effect on Adaptability, namely, Integrity at .266 and Commitment at .137.

There were 4 independent variables with a direct effect on Application knowledge, namely, Integrity at .139, Willingness to help at .152, humility at .153, Adaptability. at .220.

There were 4 independent variables with a direct effect on Commitment, namely, Integrity at .311, Willingness to help at .243, humility at .109, and Application knowledge at .178.

There were 5 independent variables with a direct effect on Not-indifferent, namely,, Integrity at .193, Willingness to help at .156, humility at .175, Application knowledge at .207, and Commitment at .159.

There were 4 independent variables with a direct effect on fighting spirit, namely Integrity at .216, Application knowledge at .099, Commitment at .355, and Not-indifferent at .180.

There were 7 independent variables with a direct effect on teamwork, namely, Integrity at .171, Willingness to help at .191, humility at .172, Adaptability at .129, Application knowledge at .123, Commitment at .130, and Not-indifferent at .125.

Regarding indirect effect, it was found that there were 6 independent variables with an indirect effect on Willingness to help, namely, Integrity at .179,

Willingness to help at .009, humility at .007, Adaptability at .076, Application knowledge at .006, and Commitment at .035.

There were 6 independent variables with an indirect effect on humility, namely, Integrity at .127, Willingness to help at .012, humility at .009, Adaptability at .006, Application knowledge at .008 and Commitment at .046.

There were 6 independent variables with an indirect effect on Adaptability, namely, Integrity at .090, Willingness to help at .044, humility at .033, Adaptability at .022, Application knowledge at .029., and Commitment at .003.

There were 6 independent variables with an indirect effect on Application knowledge, namely, Integrity at .254, Willingness to help at .013, humility at .048, Adaptability at .083, Application knowledge at .008, and Commitment at .048.

There were 6 independent variables with an indirect effect on Commitment, namely, Integrity at .257, Willingness to help at .033, humility at .099, Adaptability at .139 Application knowledge at .004, and Commitment at .022.

There were 6 independent variables with an indirect effect on Not-indifferent, namely, Integrity at .340, Willingness to help at .081, humility at .116, Adaptability at .170, Application knowledge at .033, and Commitment at .027.

There were 6 independent variables with an indirect effect on fighting spirit, namely, Integrity at .336, Willingness to help at .157, humility at .146, Adaptability at .110, Application knowledge at .109, and Commitment at .046.

There were 6 independent variables with an indirect effect on teamwork, namely Integrity at .433, Willingness to help at .095, humility at .143, Adaptability at .171, Application knowledge at .061, and Commitment at .067.

Discussion

The above research results show that the identity of graduates of the Faculty of Forestry, Kasetsart University is caused by a causal relationship consisting of 7 paths, which helps to predict and explain the formation of graduate identity more effectively by integrating psychological theories, educational theory and social science theory to develop hypothetical models and examine them with advanced statistics in the analysis of causal relationship pathways. Path Analysis is used to study the influence of various variables that affect the formation of the identity of the graduates of the Faculty of Forestry.

The emergence of identity of the graduates of the Faculty of Forestry found direct and indirect influence paths that transmit the influence of the primary variable to the following variable, which helps to predict the emergence of identity more accurately. The most influential primary variable is the "adherence to virtue towards oneself and others" variable, which is important for building trust and maintaining relationships with others. It affects the well-being of society. It points out the need to inculcate morality and ethics in students from the beginning of their studies in the faculty, which is in line with the theory of Kohlberg and Hersh (1977), who proposed the theory of ethical development. Learning through reflection on ethical thinking, especially at the higher education level, develops learning and realizing the role of morality in living and participating in society. Cultivating morality and ethics from the beginning of education is in line with the concept of learning that helps to develop students to be more ethical according to the process of ethical thinking. The *6* variables are "Committed to Accomplishing the Task", "Ready to Put Knowledge into Action", "Ready to Adapt to the Environment", "Polite and Humble", "Help and Share", and "Don't Look Down". These variables act to be influenced by the primary variable and influence the "Teamwork" and "Fighter", which are important variables in building the identity of graduates. In line with the study of Banjerdkit et al. (2013) it was found that the identity of graduates of Nakhon Sawan Rajabhat University is "graduates who work in a team, are technologically proficient, honest, and have a public spirit towards the community and the locality". Organize activities that affect the fulfillment of identity in all aspects and affect teamwork as much as possible to enable students to express desirable attributes according to the defined identity.

Creating the identity of the graduates of the Faculty of Forestry is not only about promoting one factor. Rather, it is a combination and reinforcement of several factors that work together. Developing graduates to have an appropriate identity needs to focus on promoting morality. All of these will help graduates be job-ready and able to adapt to a rapidly changing environment. This is in line with Charoenphon (2022), who found Strengthening identity with those involved, changing the concept of identity shaping from the concept of participation to the concept of cooperation. All sectors must participate in the development of learning activities, activities outside the classroom to build identity

The model developed in this research is consistent with empirical data and can be used as a guide for the development of curriculum and learning activities for students of the Faculty of Forestry to strengthen their appropriate identity and meet the needs of the labor market in the future. It emphasizes the promotion of highly influential factors and links to concrete development.

Conclusion and Recommendation

Based on a research hypothesis to prove the influence pathway model of graduate identities, Faculty of Forestry, Kasetsart University, which was developed to be accurate with empirical data, the results show that by evaluating the data-model fit, the statistical value used to check the consistency of the empirical model with the theoretical model is the use of *p*-value, which must be statistically significant. Significant (Sig.) with a value of $p > .05$ is considered to be consistent with the empirical data because when the value of $p > .05$, the result is not Sig., which means that there is no difference or consistency. The value calculated from the results is that $p = .348$.

Therefore, it can be concluded that the cause of the emergence of the identity of the graduates of the Faculty of Forestry, Kasetsart University is not only one cause, but relies on the stimulation and promotion of various causes that occur together by the graduates of the Faculty of Forestry, Kasetsart University. 41 percent are polite, humble, ready to adapt to the environment, ready to apply knowledge to practice, committed to accomplish the task, making predictions together, and helping to share. 29 percent predicted and adapted to the environment, 25 percent predicted and put knowledge into practice, 28 percent predicted and committed to accomplish the task, 46 percent predicted together, did not look down, and 46 percent predicted together. Fighters got 48 percent and "teamwork got 60 percent.

Recommendations

1. The Faculty of Forestry should formulate a policy for the development of graduate identity systematically. The Graduate Identity Path Model developed as a framework for planning by integrating the development of Graduate Identity into the Faculty's strategic plan with clear goals, indicators, and strategies, and adequate budget and resources should be allocated to support graduate identity development activities both inside and outside the program.

2. The Faculty of Forestry can use the Graduate Identity Path Model as a guide to design learner development activities both inside and outside the classroom and integrate graduate identity development into the teaching and learning process of all subjects. It focuses on activities that promote model-based attributes.

3. The Faculty of Forestry should take the extra-curricular activities provided by the faculty to students in all grades by considering the results of the activities and linking them to the identity of the graduates and then arrange or group the activities to be used as graduate development activities of the Faculty of Forestry according to the results of the analysis of the identity development path from research.

4. Suggestions for the next research: Expand the scope of education to current students in all grades to compare the identity path model between grades. Conduct semi-experimental research to study the effectiveness of graduate identity development methods and the persistence of identity generation. Create a tool to measure the identity of graduates of the Faculty of Forestry as a standard tool.

Conflict of Interest

The authors declare that there is no conflict of interest.

Acknowledgments

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Adolescent cognitive development and logical reasoning: A phenomenological study

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Abstract

This study examines the relationship between cognitive development and logical reasoning abilities among Indonesian high school science students. We drew upon Piaget's cognitive development theory to gain insight into how students at different stages of cognitive development engage with logical reasoning tasks. Our study encompassed a range of logical reasoning abilities, including control of variables, proportional reasoning, probabilistic thinking, correlational reasoning, and combinatorial logic. A phenomenological approach was employed to qualitatively analyze modified Tests of Logical Thinking (TOLT) assessments from Tobin and Capie (1981) and student interviews. After obtaining TOLT data, interviews were conducted to ensure the interpretation that had been made. Data analysis was done by organizing and interpreting data, reducing data, and drawing conclusions. The findings reveal distinct patterns of logical reasoning proficiency across cognitive stages. Students at the concrete operational stage exhibited significant challenges, those at the transitional stage demonstrated partial mastery, and those at the formal operational stage displayed advanced reasoning skills, albeit with occasional errors. These results highlight the importance of tailoring educational interventions to students' cognitive levels to enhance logical thinking and problem-solving abilities.

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Introduction

Stages of cognitive development, first identified by Jean Piaget, a Swiss psychologist, are a series of changes and developments in thinking abilities that occur as a person ages Inhelder & Piaget (1958). According to a study by Fuchs et al. (2010), there is a fascinating interplay between two critical ingredients for mathematical success: cognitive and primary arithmetic abilities. Fuchs et al. (2010) found that these areas are interrelated and influence each other. While having a strong foundation in basic arithmetic (addition, subtraction, multiplication, and division) is crucial for all areas of formal math, cognitive skills become increasingly important as

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problems become more complex. This is particularly evident in word problems, where students must translate worded descriptions into mathematical equations. Fuchs et al. (2010) underline that a child's overall cognitive development significantly influences their ability to learn and excel in mathematics. A solid grasp of foundational arithmetic skills and well-developed cognitive abilities are essential for a strong foundation in mathematics.

The cognitive development of middle and high school students is a crucial phase in which the ability to think abstractly and logically is shown. This enables the understanding of complex concepts and systematic problem-solving. Jacobson and Wilensky (2006) explained the importance of cognitive structures and beliefs in shaping the ability of learners to understand high-level concepts. Akyol and Garrison (2011) showed that cognitive development is essential for educators to effectively adapt teaching methods, tailoring lessons to students' cognitive abilities. By integrating stages of cognitive development into teaching practices, educators can provide learning that meets students' cognitive capacities, ultimately leading to improved learning outcomes in secondary school.

Studies related to cognitive stages have reported that high school students, with an average age of 17.55, and as many as 23.3 percent -45 percent reached the formal operation stage. (Gunawan et al., 2019; Rohaeti & Hindun, et al., 2019; Rohaeti & Putra, et al., 2019; Romdon et al., 2019; Sukarna et al., 2020). The results of a preliminary study in class XI of one State High School in West Bandung Regency showed that 41 percent of students were still in the concrete stage, and 59 percent were in the formal stage (Fitrianna et al., 2023). This showed that achieving the formal operation stage was not based on biological age but rather on the maturity of students' thinking. Therefore, it is crucial to conduct an in-depth study on the characteristics of each student's group at a particular cognitive stage.

Sumarmo (1987) found that the subjective logical reasoning ability and the percentage of formal subjects increased from grade 3 junior high school to grade 3 senior high school, which directly supports Piaget's view of the influence of maturity, balance, socialization, and educational and cultural transmission in children's cognitive development. In addition, about 55 percent of grade II high school students have not reached the stage of formal operations, according to Piaget's hypothesis, which emphasizes the importance of the time required to reach a particular cognitive stage. There was a significant difference in the percentage of formal subjects between different grades, which aligns with Piaget's view of the link between individual professional aptitude and expertise and the achievement of the formal operation stage. The results also showed that formal students consistently scored higher than concrete students in various observed variables, supporting Piaget's theory of higher ability in formal subjects. However, despite this, the achievements made by formal students suggest that the potential of their logical reasoning ability has not been fully utilized optimally, highlighting room for improvement in the utilization of students' logical reasoning ability in the educational context. This study has not examined the characteristics of TOLT indicators that appear at each cognitive stage more deeply.

Previous research on the cognitive stage, logical reasoning, or formal thinking has been the subject of several studies. (1) Classifying secondary school students based on their cognitive development using the Test of Logical Operations (TLO) helps educators identify their ability to think logically and develop appropriate teaching strategies (Santosa, 2013); (2) Taylor (2016), educators need to rethink their approach to students' cognitive development, especially those from marginalized backgrounds, as cultural influences can affect cognitive development. Understanding that development depends on internal factors such as intelligence and external factors such as culture is critical to inclusive learning; (3) Wattad & Chen (2023), based on Piaget's theory, most people only reach the concrete stage of cognitive development, with limited ability to think abstractly. Genetic factors play a significant role in cognitive development, while educational interventions have limited impact; (4) Visessuvanapoom & Wintachai (2024), this study validates a framework for measuring the cognitive ability of upper primary school students using qualitative and quantitative research methods. The framework consists of four components and thirteen indicators. The measurement instrument showed construct validity and categorized Thai students' cognitive abilities into four levels; and (5) Cerovac & Keane (2024) research shows that students move from concrete to abstract thinking as they age, enabling them to handle complex concepts in STEM subjects like science and math. Notably, none of these investigations explored how TOLT indicators at each cognitive stage were achieved more deeply. Therefore, the current study aimed to comprehensively describe the characteristics of TOLT indicators at each stage. The research questions addressed in this study are: What characteristics can be identified in TOLT indicators? Secondly, at each stage, how do the characteristics of TOLT indicators differ?

Literature Review

To obtain an instrument to determine cognitive stages based on Inhelder and Piaget's cognitive development theory, Tobin and Capie (1981) developed the Test of Logical Thinking (TOLT). This instrument measures five reasoning abilities: control variable, proportional, probabilistic, correlational, and combinatorial. Proportional reasoning is the ability to determine the value of a quantity based on a given proportion value. Meanwhile, the control variable is the ability to interpret information as a controller or control. Hence, other factors do not influence the relationship between the independent and dependent variables. Probabilistic or chance reasoning is the ability to determine the possibility of an occurring event. Correlational reasoning is the ability to draw conclusions based on the cause-and-effect relationship of given statements. Furthermore, combinatorial reasoning is determining all possible alternatives in a particular event. These five abilities are indicators that a child is at the formal operational stage (Han, 2013; Oogarah-Pratap et al., 2012).

In order to assess the extent of cognitive development in individuals, several instruments have been devised, employing a variety of methodologies. One such instrument is the Longeot Test, devised by Sheehan (1970), which assesses an individual's capacity to solve problems by evaluating their logical reasoning and conceptual understanding. In contrast, the Logical Operation Test, developed by Leongson & Limjap (2003), assesses logical thinking ability but with greater emphasis on more complex mental operations and their application in real situations. Meanwhile, Tobin & Capie, TOLT (Test of Logical Thinking), introduced in 1981, offers a more systematic approach to evaluating logical thinking and scientific ability, considering broader aspects of cognitive development. Despite sharing a common objective, these three instruments offer distinct perspectives on assessing and comprehending individual cognitive abilities.

TOLT, developed by Tobin and Capie (1981), specifically measures one dimension, namely, formal thinking. Formal operational reasoning can develop gradually and lead to refinements developed at the concrete stage. The structure of the formal stage consists of specialized information processing abilities that enhance adolescents' ability to follow logical reasoning. TOLT was chosen because of the reliability and validity results by Tobin and Capie (1981), with a sample of students ranging from sixth grade to college. Therefore, it was considered appropriate for the age range of subjects to be used in this study. The stages of cognitive development, as proposed by Piaget, are critical in understanding thought processes and learning abilities. According to Miller Hudson (Milton et al., 2019), students at the concrete stage learn by manipulating physical objects to build an internal understanding of mathematical concepts. The study results of Susac et al. (2014), found that participants aged 13–15 solve equations using concrete strategies such as entering numbers, while participants aged 15–17 solve equations using rule-based strategies. This shows that students develop an abstract mindset, using pure symbols for reasoning without relying on perceptual data.

Methodology

This study used a qualitative method with a phenomenological design to explore participants' perceptions. The method allowed for an in-depth exploration of the phenomena consciously experienced by participants and an understanding of the experiences and perceptions of qualitatively different individuals. According to Langdridge (Suryadi, 2019), Phenomenology is a qualitative method that focuses on the human experience as a topic according to its frame of reference. It is related to meaning and how meaning is obtained through experience. A phenomenological design was used to comprehensively explore the characteristics of TOLT indicators at each cognitive stage. The following research framework will be carried out using a phenomenology design as illustrated in Figure 1.

Participants

In selecting the research subjects for this study, the characteristics of age and educational level relevant to their cognitive development were considered. According to Piaget's theory, grade XI science students in senior high school between the ages of 16 and 18 are in an essential stage of cognitive development. At this age, students are generally in the formal operation stage, where they begin to develop the ability to think abstractly and logically. Selecting subjects based on this criterion allows researchers to explore and analyze cognitive processes relevant to formal reasoning and to understand how students at this stage of development deal with scientific and mathematical concepts.

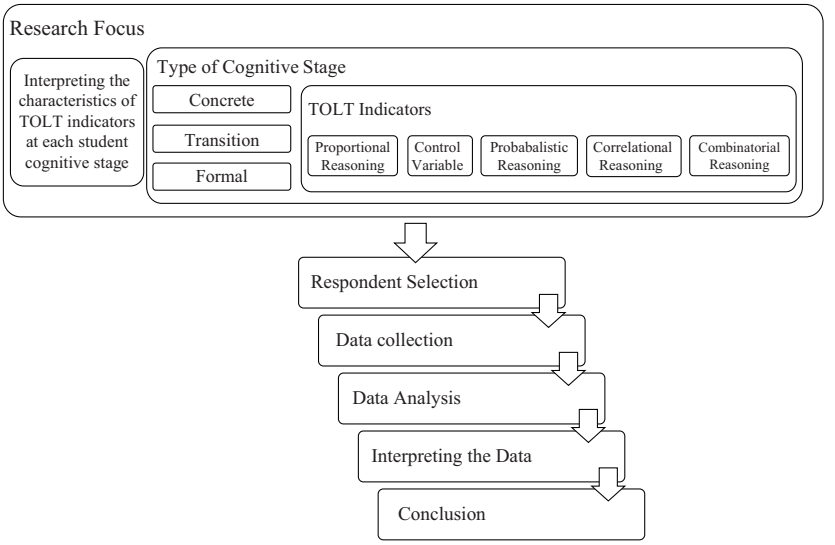


Figure 1 Research framework

Data Collection

Cognitive stages were obtained from TOLT modified by Tobin and Capie (1981), translated into Indonesian, and declared valid (Sumarmo, 1987). This test comprised ten items, which are, (1) Proportional Reasoning, (2) Control Variables, (3) Probabilistic or Chance Reasoning, (4) Correlational Reasoning, and (5) Combinatorial Reasoning. Responses to TOLT showed a score that refers to cognitive stages, namely, concrete, transitional, or formal operational. The scoring guidelines and stage classification are described in Table 1 and Table 2.

Table 1 TOLT scoring guidelines

Problem Number	Criteria	Score
1–8	Correct answer and reason.	1
	Wrong answer and reasoning or vice versa.	0
9 and 10	Combination and number of correct combinations.	1
	Combinations are repeated, and the answer contains all correct combinations.	0
	The number of correct answers is 24, students answer the number of combinations is 25, and 24 are correct.	0
	There is one wrong combination.	0

Source: Sumarmo (1987)

Table 2 Classification of cognitive stage

Test score	Classification of Cognitive Stage
0–3	Concrete
4–5	Transitional
6–10	Formal

Source: Sumarmo (1987)

Data Analysis

The steps described by Rolfe (2006) for qualitative data analysis were used as the basis for developing the analytical framework in this study, with particular adaptations to suit the specific context and needs of the research being conducted, as described in Figure 2.

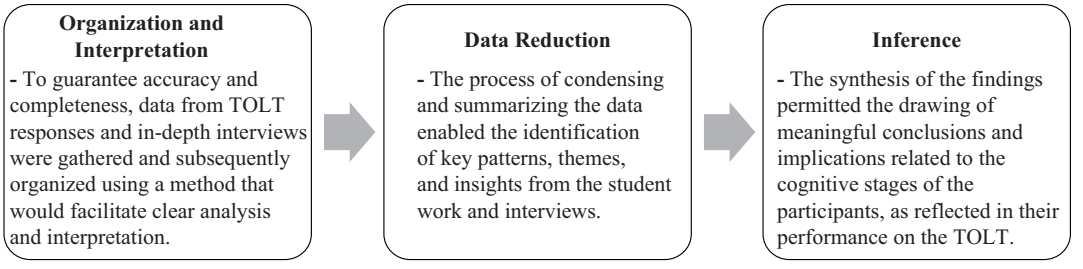


Figure 2 Analysis framework

Results and Discussion

This study involved 27 grade XI students. Each student took a test to categorize them into cognitive levels. Tobin and Capie (1981), modified the indicators on the TOLT, which measures five aspects of reasoning: proportional reasoning, variable control, probabilistic, correlation, and combinatorial. The following is the distribution of the acquisition of each indicator of logical reasoning based on each group of students' cognitive stage.

Figure 3, The distribution of logical reasoning indicators across cognitive stages aligns with Piaget's cognitive development model. Students in the concrete stage typically exhibit lower logical reasoning abilities (Cerovac & Keane, 2024). This stage is characterized by concrete thinking and less egocentricity, which may explain why students in this stage fulfill only two logical reasoning indicators. On the other hand, students in the transitional stage demonstrate the capacity to fulfill four logical reasoning indicators (Fadiana et al., 2019). This stage represents a transition towards more abstract and formal thinking, aligning with the observed fulfillment of 4 indicators in the transitional stage. Furthermore, students in the formal stage can fulfill five logical reasoning indicators. This stage is associated with higher problem-solving abilities, emphasizing the importance of logical thinking skills in identifying cognitive development levels (Fadiana & Andriani, 2021).

Proportional Reasoning

Proportional reasoning is understanding and solving problems involving ratios and scaling. The TOLT assesses this skill through questions about orange juice and glass proportions. Students at this stage were unable to answer these questions correctly.

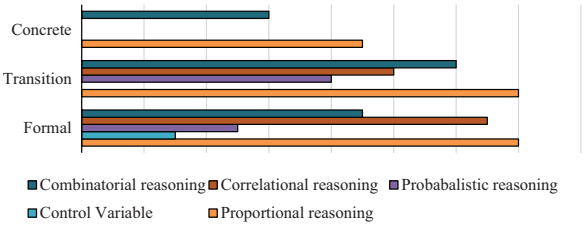
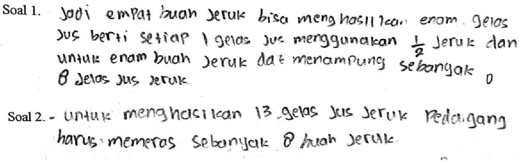


Figure 3 Distribution of score of each logical reasoning indicator based on cognitive stage

Figure 4 illustrates that one of the answers at the concrete stage for problems 1 and 2 was incorrect. The reasoning provided by the student did not utilize comparison, indicating a lack of proportional reasoning. This finding aligns with the theoretical framework that categorizes reasoning stages, particularly as Izzatin (2022) described, which delineates various levels of proportional reasoning. Students at the transitional stage demonstrated proportional reasoning skills, although they did not explicitly use comparison or proportion terms in their explanations. Their correct answers and interview evidence confirmed their understanding of these concepts. This aligns with research by Jitendra et al. (2013) and Lundberg (2022), which posits that developing proportional reasoning skills is essential for bridging basic arithmetic to more advanced algebraic concepts. Students provided correct answers and reasons at the formal stage, although their mathematical attempts to use comparison or proportion were incorrectly written. Nevertheless, students demonstrated the ability to engage in proportional reasoning, a crucial aspect of mathematical and scientific thinking. Their efforts to apply the concept of comparison or proportion in their answers indicate their developing ability to recognize relationships between different quantities in mathematics. The evidence from Ojose (2015) reinforces this by indicating that students who understand proportion often utilize visual aids or manipulative strategies, reflecting their attempts to conceptualize the relationships between quantities. Furthermore, the perspective offered by Nugraha et al. (2023), highlights an important counterpoint: students must also engage with non-proportional situations. This insight suggests that while proficiency in proportional reasoning is vital, a comprehensive mathematical education must encompass a variety of problem-solving contexts. The ability to differentiate between proportional and non-proportional reasoning could further enhance students' overall mathematical understanding, allowing for a more robust and versatile skill set.



Translation:

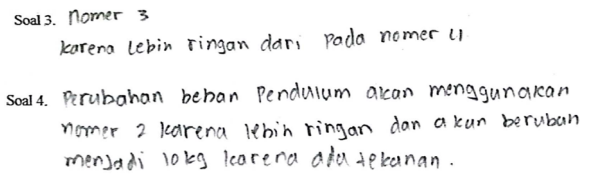
Problem 1.
Four oranges can produce six glasses of juice, meaning that each glass of juice uses ½ oranges and can hold as many as eight glasses of six oranges.
Problem 2.
The trader must squeeze eight oranges to produce 13 glasses of orange juice.

Figure 4 C-1 Student's answer for proportional reasoning

Control Variable

Controlling variables is essential for understanding cause-and-effect relationships. The TOLT assessed this skill through pendulum problems, requiring students to isolate the impact of string length or weight on swing time. Despite the importance of controlling variables, all students struggled to solve these problems correctly.

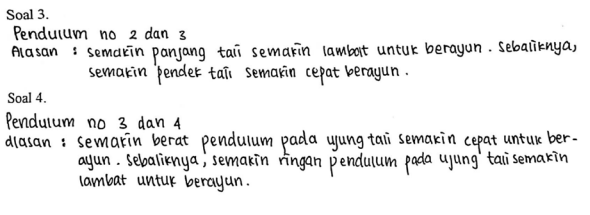
Figure 5 and Figure 6 show that, students at the concrete and transitional stages struggled to understand and apply control variables in the pendulum experiment, with even those at the formal stage, as shown in Figure 7,



Translation:

Problem 3.
Pendulum number 3 because it is lighter tan pendulum number 4.
Problem 4.
Pendulum number 4. The change in pendulum load will use number 2 because it is lighter and will change to 10 kg due to pressure

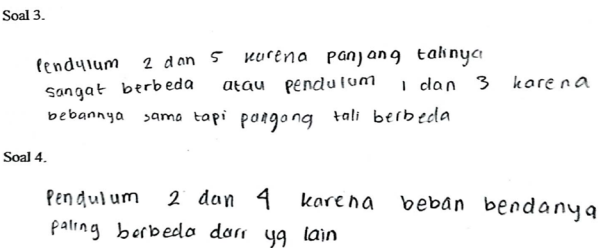
Figure 5 C-1 student's answer for the control variable



Translation:

Problem 3.
Pendulum 2 and 3.
Reason: The longer string, the slower it swings. Conversely, the shorter the string, the faster it swings.
Problem 4.
Pendulum 3 and 4.
Reason: The heavier the pendulum is at the end of the string the faster it swings. Conversely, the lighter the pendulum at the end of the string the slower it swings.

Figure 6 T-1 student's answer for control variable



Translation:
Problem 3.
Pendulum 2 and 5 because the lengths of the ropes are very different. Or pendulums 1 and 3 because the load is the same, but the length of the string is different.
Problem 4.
Pendulum 4. Pendulums 2 and 4 because the object's weight is the most different from the others.

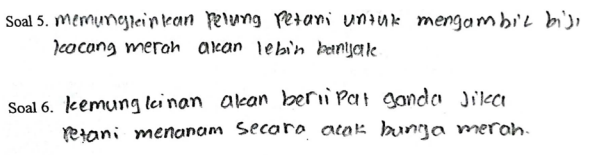
Figure 7 F-1 student's answer for control variable

showing difficulties. This suggests a general lack of proficiency in controlling variables across cognitive stages, indicating that students in the formal stage may still be developing these abilities, as per Piaget's theory. Research by Commons and Davidson (2015) found that formal-stage students performed moderately better than those at the concrete and transitional stages but showed a potential lack of variable control ability. This finding aligns with Bredderman (1973), which indicates that the ability to control important variables develops through experience and is uneven among individuals, independent of age and IQ. This indicates that although Piaget's theory offers a valuable framework for understanding cognitive development, the variability in the development of the ability to control variables underscores the significance of practical experience and individuality in the learning process. Consequently, not all students at Piaget's formal stage will necessarily possess the full ability to control variables, given that this development is profoundly influenced by experience and not merely by age or intelligence development.

Probabilistic Reasoning

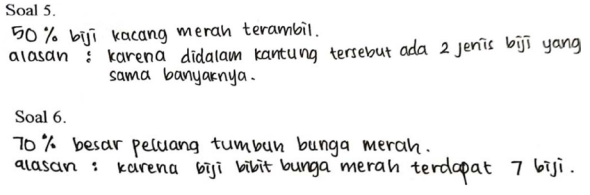
Probabilistic reasoning involves calculating the likelihood of an event occurring. The TOLT test assessed this skill through problems 5 and 6. Students were expected to determine the probability of selecting a specific object from a given set. However, students at the concrete and transitional stages struggled with these problems, either providing incorrect answers or not attempting them.

Figure 8 shows students' answers at the concrete stage and Figure 9 shows students' answers at the transitional stage. Students at both concrete and transitional stages struggled with probabilistic reasoning. They had difficulty understanding basic probability concepts and applying them to problem-solving. While transitional students showed some awareness of probability, their understanding was superficial and often led to incorrect answers due to misconceptions.



Translation:
Problem 5.
There will be more opportunities for farmers to pick up red bean seeds.
Problem 6.
The probability will double if the farmer randomly plants red flowers.

Figure 8 C-1 student's answer on probabilistic reasoning



Translation:
Problem 5.
50% of the red bean seeds are picked up.
Reason: Because there are 2 types of beans in the bag that are equal in number.
Problem 6.
70% chance that a red flower will grow.
Reason: because there are 7 red flower seeds.

Figure 9 T-1 student's answer on probabilistic reasoning

Both stages were influenced by concrete thinking, making it difficult to grasp abstract probabilistic concepts. The study by Lawson and Thompson (1988) found that logical thinking ability was the most influential factor in student misconceptions. Students with formal thinking have fewer misconceptions than students with concrete thinking ability. Students at the concrete operational stage who do not use formal reasoning patterns effectively may fail to overcome misconceptions, including probabilistic reasoning. Begolli et al. (2021) also found that students with lower proportional reasoning ability might face challenges in learning probability. In the formal stage, the answers and reasons given were diverse and led to the concept of probability but had not been written in a systematic sentence.

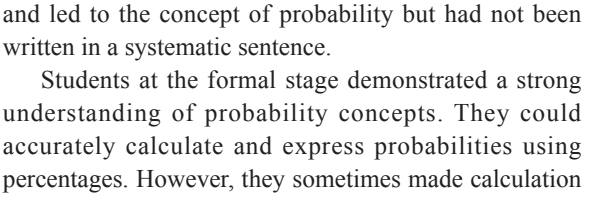
Students at the formal stage demonstrated a strong understanding of probability concepts. They could accurately calculate and express probabilities using percentages. However, they sometimes made calculation errors or misinterpreted the problem, leading to incorrect answers. Despite these minor issues, their overall grasp of probability was significantly better than those at earlier developmental stages. A study by Oaksford and Chater (2009), found that the strength of adopting a probabilistic perspective is its capacity to handle uncertainty and evaluate alternative interpretations of observed events.

Students' probabilistic reasoning abilities vary across cognitive stages, with those in the concrete and transitional stages struggling more than those in the formal operational stage. However, even formal operational students may struggle to articulate their reasoning, underscoring the need for targeted interventions to enhance their proficiency in handling probabilistic concepts.

Correlational Reasoning

Correlational reasoning involves identifying relationships between variables. The TOLT assessed this through problems with rats and fish. Students were asked to determine if there was a connection between size and color (for rats) or pattern and size (for fish). While some concrete-stage students could identify correlations, responses varied widely.

Figure 10 indicates that students did not answer problems 7 and 8 correctly, suggesting difficulties in understanding complex concepts related to variable relationships. Interviews revealed that while students noticed variations in the size and color of rats and fish, they struggled to formulate mathematical reasons to support their arguments. This implies that students did not fully grasp the relationships between variables or found in-depth data analysis challenging. Consequently, students at the concrete stage are still in the process of understanding the concept of correlation between variables despite being able to observe data variations. Cognitive limitations associated with the concrete operational stage, such as a focus on concrete examples and a lack of abstract reasoning ability, contributed to challenges in demonstrating correlational reasoning. Widodo et al. (2020) found that students at the concrete stage often skip the planning stage and only interpret the final result, suggesting a reliance on a simple three-step pattern: recognizing the problem, formulating a response,



Translation:
Problem 7.
Not all fat rats have black-tailed.
There are also fat rats with white tails and small mice also have white and black tails.

Problem 8.
Not all fat fish have broad stripes because even small fish have broad stripes.

Figure 10 C-1 student's answer for correlational reasoning

and providing an answer. It can thus be concluded that students at the concrete operational stage are still in the process of developing an understanding of the relationship between variables.

In contrast, students at the transition stage demonstrate the development of the ability to perform complex analyses and construct detailed arguments. This progression marks a shift from concrete to more abstract reasoning abilities, essential for understanding and applying concepts related to variable relationships. While they could identify some patterns, their explanations of cause-and-effect were weak. Overall, they are developing analytical skills but need further guidance. Students at the formal stage correctly answered problems 7 and 8 and provided reasons relevant to the tested concepts, indicating a strong understanding of the material. They explained why fat mice had black tails, and fat fish tended to have thin lines, demonstrating their grasp of the correlation between body weight and physical characteristics. Their explanations were based on visual observations and an understanding of the correlation between the number of animals in each category and their physical traits. This ability to analyze data and infer causal relationships showed that students could identify patterns and generalize information to reach relevant conclusions. The findings align with Piaget's theory (Coletta & Phillips, 2005), which states that a person at the formal stage can think abstractly. It is only at this point that individual are able to control and isolate variables or look for relationships such as proportions. Therefore, transitioning from the transitional to the formal stage indicates a notable advancement in students' comprehension of variable relationships.

Combinatorial Reasoning

Combinatorial reasoning involves finding all possible combinations of items. Students were tested on this by creating different sequences. Most struggled initially but showed improvement in later tasks.

Figure 11 shows that students at the concrete stage struggled with combinatorial reasoning, often repeating combinations due to a limited understanding of combination and permutation concepts. Their concrete thinking hindered their ability to grasp and apply abstract concepts, leading to difficulties in effectively engaging in combinatorial reasoning. This finding aligns with Hidayati et al. (2020), which found several levels of combinatorial reasoning; one is that students can understand the problem but cannot provide the correct answer. Consequently, students at this stage may be able to identify the elements in a combinatorial problem but cannot devise strategies to solve the problem effectively.

Students at the transitional stage showed improved combinatorial reasoning compared to those at the concrete stage, correctly identifying combinations but struggling with permutations. While transitional and formal-stage students demonstrated potential in combinatorial reasoning, they faced challenges in consistently applying permutation concepts accurately, leading to incomplete or incorrect answers. This finding aligns with Lockwood, (2013), who found that the student might initiate a counting problem by trying to find a correct solution initially. They might opt for a specific counting method that produces a series of results.

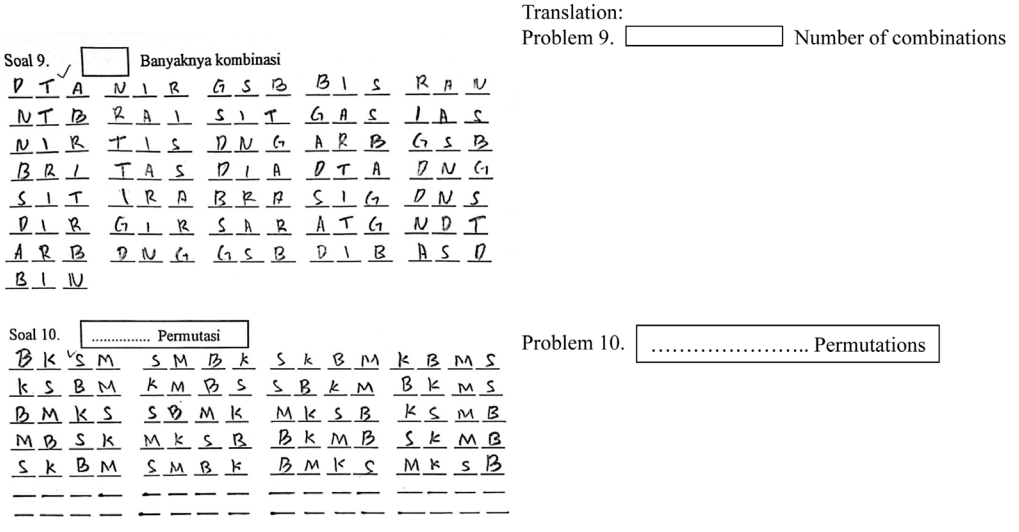


Figure 11 C-1 student's answer for combinatorial reasoning

Afterward, the student could assess whether this series accurately addresses the counting problem. If the produced series of outcomes does not match the intended one, the student could compare both sets and then revert to the counting process to devise a method that accurately enumerates the desired outcomes. This process entails alternating between counting methods and sets of outcomes. While combinatorial thinking is an essential component of knowledge and experience building for students, the findings of Hidayati et al. (2020) indicate that this approach presents a significant challenge for some learners. Cahyanti et al. (2020), indicate that only 24 percent of students demonstrate high combinatorial reasoning. This suggests that students encounter challenges in consistently applying combinatorial concepts. Overall, the findings and some previous research suggest that although students at the transition stage have shown progress, they still need more guidance to strengthen their understanding and application of combinatorial concepts, especially concerning permutations.

Students at the formal stage demonstrate good problem-solving skills, although they still face challenges in applying probability and combinatorial concepts. These findings highlight the importance of adapting teaching methods to students' cognitive levels and using structured, developmentally appropriate approaches. The concept of abstraction (Dong et al., 2019 as site in Irawan et al., 2024) simplifies material by reducing unnecessary detail. For students at the concrete stage, abstraction helps to simplify complex mathematical concepts into a more understandable form. In contrast, for students at the formal stage, abstraction enables them to understand and apply more complex principles more effectively. Therefore, it can be assumed that integrating the principle of abstraction into teaching methods that are structured and adapted to students' cognitive levels can significantly improve their understanding and problem-solving skills.

Conclusions and Recommendation

This study analyzed 27 grade XI students using TOLT to determine their cognitive level. Piaget's cognitive development model corresponded to the distribution of logical reasoning indicators. Concrete-stage students showed lower logical reasoning ability, while formal-stage students showed higher problem-solving ability. The characteristics of students at the concrete stage were found to have several conditions, including (1) inability to use the concept of comparison when solving proportional reasoning problems; (2) lack of understanding of control variables; (3) deficiency in providing answers by taking into account the concept of chance; (4) difficulty in explaining the relationship between two different concepts; and (5) inability to use combinatorial concepts in solving problems. The students at the transition stage show several characteristics, including (1) the ability to provide descriptions and the concept of comparison in solving proportional reasoning problems; (2) an understanding of the problem, although still unclear in determining which variables to control; (3) an understanding of the problem and the concept of chance, but not yet able to apply it effectively in problem-solving; (4) the ability to show causal relationships, although limited when doing descriptions; and (5) not yet using combinatorial concepts in solving problems. These findings highlight the development that takes place at the transition stage and point to areas that need further attention in the education of students at this stage. The students at the formal stage were found to have several conditions, including (1) the ability to use the concept of comparison in solving proportional reasoning problems; (2) an understanding of the problem, although not yet fully understanding the variables to be controlled; (3) an understanding of chance problems and concepts, but still unable to apply them effectively in problem-solving; (4) the ability to show causal relationships, which can be well described; and (5) not yet using combinatorial concepts in solving problems. These findings show significant progress at the formal stage but also highlight areas for continued improvement in education at this stage.

To enhance mathematics learning, the study recommends; (1) Tailoring teaching methods to students' cognitive levels; (2) Employing student-centered and problem-based learning approaches; (3) Utilizing technology for visualization and personalized learning; (4) Providing specific and constructive feedback to all students; and (5) Fostering partnership between teachers and parents. These strategies aim to address the diverse needs of students at different cognitive stages and improve overall mathematical understanding.

Conflict of Interest

The authors declare that there is no conflict of interest.

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The development of ethnic settlement formation in Jambi Region, Indonesia: Tracing the history and development of the port city area

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Abstract

Jambi is one of the historical areas that underwent a transformation from a traditional to a modern area. The development process has resulted in the formation of settlements that have been interesting to study in recent decades: ethnic settlements in Jambi. The purpose of this research is to explore the formation of ethnic settlements in Jambi. The method used in this research is the 4 stages of the historical method – heuristics (source collection), source criticism (internal and external criticism), interpretation (interpretation), and historiography (historical writing). In addition, an ethnohistorical approach is also used to obtain more comprehensive results. The results showed that ethnic settlements emerged gradually in Jambi. In the early stages, ethnic settlement locations were scattered irregularly, then organized by race and class, and finally developed into ethnic settlement locations. The formation of ethnic settlements in Jambi Harbor was influenced by regional morphology and political government factors at each stage.

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Introduction

Social, economic, cultural, and technological processes are closely related to the spatial patterns formed, which are the result of complex interactions between various aspects and levels. At the level of households, residences, and location choices, there are differences in characteristics that are interesting to study because of inter-ethnic differences (Dienaputra, 2023). Human activities that are concentrated to access certain resources and settle in an area lead to the formation of settlements. A very important initial stage is determining the first residence of an ethnic group. Not all ethnic groups are given the freedom to choose their own place of residence. Some people prefer to live in a place that suits their culture (Rahman et al., 2022). This is also true for some ethnic groups with different settlements, so they have unique spatial dimensions because their locations are their own.

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There are two spatial dimensions revealed in the study of the distribution of ethnic settlements: the dimension of clustering or equalization and the dimension of isolation or occurrence. Variations in these patterns are caused by differences in residential locations between majority and minority ethnic groups (Laiprakobsup & Laiprakobsup, 2023). Spatial patterns are also influenced by such things as political policies, history, economic restructuring, and the concept of the state (Khamwachirapithak & Khongouan, 2024). In the study of settlement distribution, the horizontal diversity of the population in the Jambi region is interesting to study. Cultural differences and geographical conditions are the main factors that determine whether there is separation between ethnic settlements (Paramarta et al., 2023).

One form of adaptation to the environment in Jambi is the ability of ethnic groups to gain access to strategic locations (Putra, 2006). To better understand this phenomenon, the horizontal heterogeneity of Jambi's population should be further researched using scientific methods. The formation process of the dynamic development of ethnic settlements is identified through historical research. The Jambi region has many river characteristics, one of which is the Batanghari River, which is the longest river on the island of Sumatra. In addition to its distinct appearance, this area has been a center of cultural mixing since the days of the Jambi Malay Kingdom (Tasman, 2016). This is due to its strategic location and significant political influence. The adaptation process shows the ethnic diversity of the people living here, especially in the context of horizontal heterogeneity. The article aims to investigate the evolution of ethnic settlements in Jambi, relating them to the periods before and after Hindu and Buddhist influence, Islam, Dutch colonialism, and post-independence. Each era has a unique settlement management policy, influenced by certain reasons that impact the idea of regional development (Aldiansyah & Nareswari, 2019).

Literature Review

Accessing certain resources and starting the process of developing an area becomes a human activity to form a settlement. In the context of the region, this phenomenon is related to the morphology of the region, such as land use, road patterns, and building types. There are many global studies related to settlements with various disciplines and approaches. One of the settlement studies that has been conducted examines the evolution of rural settlement patterns in southern New England, New South Wales. The study differentiated the settlement into several periods: 1832–1848, 1848–1861, 1861–1900, and 1900–1962. The results showed that there were five main factors that contributed to the cultural landscape. These were the influences of the physical landscape, the establishment of around 50 pastoral posts in the first 16 years of white settlement, the discovery of scattered minerals in the second half of the nineteenth century, transportation routes such as the railway in the 1880s until the 1920s, and the importance of land laws (Smailes & Molyneux, 1965). Although this study is about settlements on land, it can be used as a reference to understand the formation of settlements that are influenced by several main factors (Ambary, 1977).

Furthermore, a recent study on settlements was conducted by Yang, which was linked to future conservation plans. He explored the importance of the morphological evolution of traditional villages in the conservation plans of the authorities. Knowledge of spatial-temporal changes in village patterns can be gained from historical studies. Rural spatial growth can be divided into two types: edge expansion growth and periphery growth. Yang selected five traditional villages in China based on the availability of spatial processing data. His study explored the similarities and differences in the dynamic spatial evolution of traditional villages from clustered to dispersed (Yang, 2002).

In Indonesia, there have been many studies on settlements. There are several studies that later became references in this research. First, research that discusses the concept of waterfront in the ethnic settlements along the Semarang River. The ethnic Semarang Rivers referred to in this research are Malay Village, Old City Area, Chinatown Village, Kauman Village, and Sekayu Village. This research shows that only Kampung Melayu and the Old City Area initially used the waterfront concept because they are port, warehousing, and trading areas. Chinatown Village is only a trading area (Sarinastiti, 2015).

Second, a study that uses archaeological data to reveal the development of the Giri settlement. The research shows a shift in the core of the Giri settlement. The shift of the settlement center was caused by several factors that were also the main factors in the formation of the Giri settlement, i.e., religious factors. Then there are the natural factors that do not support the development of the agricultural sector, so the Giri settlement depends on the home industry sector and trade by small capitalist professional groups. The group is outside the feudal environment (past Giri settlement) (Nurhadi, 1983).

Third, a study that discusses the development of the form and structure of Surabaya as a port city in

terms of transportation development, political situation, and economy from the 13th to the early 21st century. Although this study is an architectural study, it can be a reference to the process of an urban settlement developing. This research shows that the settlement that developed and became a port city was strongly influenced by political factors, such as Dutch colonial policies related to settlements that were regulated by groups and established Batavia, Semarang, and Surabaya as port collecting centers at the end of the 19th century Hartono and Handinoto (2007).

Furthermore, there are several previous studies related to settlements in Jambi. First, research on ancient settlements on the banks of the Batanghari River during the Malay period. Several archaeological sites found indicate the concentration of ancient settlements on the banks of the Batanghari River. Jambi's environmental conditions, which have many rivers, cause rivers to become the main transportation routes to and from the interior. Around these transportation routes, there are usually settlements. The strategic factors of the area determine the size of the settlement group. This research looks at the size and development of settlement groups based on the size of the sites found. This archaeological research can be a starting point regarding knowledge related to settlements in Jambi (Utomo, 1990).

Second, research on settlements in the Batanghari Delta, East Coast of Jambi, in the 11th–13th centuries AD. Although the study is an archaeological study of settlements, it is able to provide an explanation related to settlements based on sites found along the Batanghari Delta. Because the archaeological research was based on sites, it seemed to rule out political and historical aspects, even though it discussed economic and environmental factors. The research suggests that settlements in the Batanghari Delta were not always dependent on locational or resource feasibility but were also influenced by trade (Retnaningtyas, 2004).

Methodology

This research uses the historical method, which include heuristics, source criticism, interpretation, and historiography (Gottschalk, 1969). Primary and secondary sources were collected at the heuristic stage, with the main sources being documents of the Dutch colonial government found in the National Archives of the Republic of Indonesia (ANRI). Secondary sources in the form of journals, books published during the Dutch colonial government regarding the condition of Jambi, and reports on archaeological findings in Jambi were obtained from the Indonesian Center for Archaeological Studies and the National Library of the Republic of Indonesia (Perpusnas), Jakarta. After the heuristic phase, the source criticism phase began. Source criticism is classified into internal and external criticism. The aim is to ensure that the sources used in the writing are authentic. The next stage is interpretation, which means interpreting the results of analysis and synthesis. Writing as a historical construction, or historiography, is the final stage of this process.

This research also uses ethnohistorical concepts to explore ethnic settlements. Ethnohistoricism has two main interests: historical ethnography and non-literary cultural historiography. Historical ethnography tends to be a descriptive reconstruction of synchronic ethnography based on written documents either produced by natives or not while non-literary cultural historiography is like oral tradition, comparative ethnology, archaeology, etc. (Sturtevant, 1966). Archaeological settlement sites can be seen as an important part of ethnohistory because they can provide information on spatial development and transformation in the pre-Hindu-Buddhist, Hindu-Buddhist, and colonial periods. One of them is the development of an ethnic settlement.

The next important thing in this research is the spatial and temporal boundaries. The spatial boundary of this research is an area currently called Jambi Province. The explanation in this paper uses several references that still refer to the same place or part of the same region. The first is "Jambi region," which is used based on the temporal context during the pre-Hindu-Buddhist, Hindu-Buddhist, Islamic, colonial, and post-independence periods. The second is "Jambi province", this designation has been used since 1957, after Jambi province became a separate province that was previously still part of Central Sumatra Province. Third, there is the "port city area," where this designation refers to two port cities – Tungkal Port and Sabak Port, which are the two largest port cities in Jambi Province. Meanwhile, the temporal limitation in this study starts from the ancient Malay in Jambi (around the 3rd century AD) until the end of the 20th century.

Regional growth can be divided into several stages: the early stage, the young or adolescent stage, the mature stage, and the old stage (Mumford, 1997). In the early stages, there is an unclear choice of settlement and trade locations. In the young or adolescent stage, clustering begins to occur in certain areas. On the outskirts of the city, large houses and factory complexes also begin to appear. The mature stage, where new areas begin to emerge, includes industrial, commercial, and residential districts

that appear according to a specific plan. There is clear residential zoning and separation between industrial and commercial areas. High-end residential areas are on the outskirts of the city, while low-end residential areas are near commercial centers and newly built factories (Hoggart et al, 2002). In the old stage, the city begins to decline for economic and political reasons.

These stages are used by the researchers to observe the process of forming ethnic settlements in the Jambi region, where the location of settlements is strongly influenced by morphological and political elements. However, the urban settlement situation in Jambi has just entered the maturity stage (Ginsburg, 1984). Therefore, the fourth stage does not need to be explained because it will deviate from the actual situation. The political aspect was also considered in the research because considerations taken by the government throughout history had a special impact on the growth of settlements, which also had an impact on the existence of settlements for each ethnic group (Kansky, 2021).

Results and Discussion

Early Settlements in the Jambi Region

A. Early Malay settlements in Jambi

The main characteristic of Jambi is the hilly highlands with rivers that empty into the coast. The river is the center of human life—a place to live, a place to trade, even a place for activities. The community usually live around the Batanghari River. Because this area produces a lot of wood, many buildings are made of wood. As a result, since only a few remnants of pre-Hindu-Buddhist settlements were found, the physical condition of the area at that time still needs to be studied in more depth.

The Jambi Malay community generally works in the agricultural sector as huma farmers. They have a leader named Demang Lebar Daun who has the task of being a speaker in this community using Malayik, or Old Malay, in his daily life. Around 100 AD, Austronesian people migrated to western Kalimantan to become Old Malay farmers. After crossing the Karimata Strait through Tambela Island in the Riau Islands, they finally settled partly in the southeastern region of Sumatra, which includes Jambi, South Sumatra, Lampung, and in the west of Peninsular Malaysia (Marzali, 2023).

The ancient Malay peasant community did not know the political system of kingship before the influence of Hinduism and Buddhism came from India. Demang Lebar Daun was not a king, but he was the head of a group of huma farmers who controlled the customary forest area. One of the customary forest areas in the Old Malay farming community of Jambi is called batain, and the group is called Pebatinan. The traditional government system derived from Austronesian culture, one of which in Jambi is known as pebatinan, is led by batin. News about the land of Sumatra, especially Jambi, which is rich in gold and various forest products that become trade commodities such as pepper, cinnamon, and resin wood, is widely spread. As a result, nobles from East and South India migrated to the archipelago and also to Jambi (Asnan, 2016). The indigenous people viewed the Indian culture brought by the migrants as a reflection of the kingdom of heaven. The king was considered a representation of God. Both sides reached a consensus with a treaty that the ancient Malay farmers made with a powerful king who was believed to be a descendant of God. The early Malay kingdom that emerged in Kebatinan, Lebar Daun had a government similar to the ancient Malay kingdom of Jambi (Andaya, 2016).

In old literature, Jambi is a famous region, which can be seen in Chinese inscriptions and news often mentioning the name of this country. This shows that the Chinese people have had a long relationship with Jambi, especially with the Jambi Malay tribe called Chan-pei. Three ancient Malay kingdoms in Jambi are thought to have existed: Koying, Tupo (3rd century), and Kantoli (5th century) (Rahim, 2022). In the history of the kingdoms of the archipelago, especially Jambi, the Minanga Kamwa region is the birthplace of the founder of the Malay Kingdom. From this region, many kings were born throughout the archipelago, including those who now reside in Malaysia, Brunei, and Indonesia. The Jambi region was once ruled by several great powers, such as Srivijaya, Singosari, and Majapahit (Munoz, 2009). Even some ancient artifacts show that Jambi was the center of the Sriwijaya Kingdom. Around 500 BC, many Anam and Champa people came and settled in the Jambi area. They fled from war and established settlements that are now known as Dusun Tuo in Bangko and Sumando Darat. They entered through many rivers, including Batang Kampar, Batanghari, and Musi and established settlements on the coast. In addition, people from the Cambodian, Kochin Siamese, Kasi and Munda, and Pegu Burmese communities migrated. (Salleh, 1997). They returned from the coast to Muara Takus, then to Tanah Pilih Jambi. Then the Malay Kingdom, which was centered in the city of Candi, was formed. Later they moved to Ujung Jabung and Tanah Pilih, and from there they moved to Sungai Langsat, and some residents moved to Pagaruyung (Schnitger, 1989).

Envoys from Ho-lo-tan and Kan-to-li came to China between 430 and 475 AD, according to the Liang Dynasty history book. Its customs were largely similar to those of Cambodia and Champa. Areca nut, cotton, and colored cloth were the country's main products (Marzali, 2023).

B. Early settlement of the ancient Malay Kingdom of Jambi

Hindu-Buddhist settlements came to Jambi and formed the Malay Kingdom. Chinese records from the Tang Dynasty in 644–645 AD record the arrival of envoys from a country called Mo-lo-you. Chinese Buddhist priest I-Tsing recounted his journey from Canton in China to Nagapattam in India in 671/672 AD. There, he stopped at She-li-fo-she (Srivijaya) to study Sanskrit for 6 months. From there, he went to Mo-lo-you and stayed for two months before going to Chieh-cha (Kedah) and then to India. On his return journey in 685, he stopped again in Malay, which he called She-lifo-she, for six months (Utomo, 1992).

I-Tsing's travelogue sources show that when he first arrived in Malay and Srivijaya in 671/672 AD, there were two independent kingdoms: Mo-lo-you and She-li-fo-she. Moreover, Malay and Srivijaya were important merchants to him, as he always visited them both on his departure and return. Traces of Buddhism are nowhere to be found except at the Muara Jambi site (Soekmono, 1995). The area is lively because of the many temples and their diversity. The temple is estimated to have been built in the 4th to 11th centuries AD. This settlement expanded the study area for Indian monks who wanted to improve their education. The Jambi Malay Kingdom settlement is an educational area, and its structure is similar to Nalanda University in India.

According to history, when the Srivijaya Empire was strong in 784, its students were sent to India to study. The government built a library and provided 2,000 rooms for the students. However, Buddhism in India was destroyed due to the invasion of other countries. Therefore, education moved to Muaro Jambi Temple in Sumatra, and the graduates returned to India after the religious reforms in Tibet. According to I-tsing's travel records, in the residential area of Muaro Jambi Temple, no less than 1,000 monks came to Muara Jambi to study Buddhism. Settlements in the Muaro Jambi Temple area were inhabited and became a meeting place for various cultures, such as Persia, China, and India (Lapian, 1978). With the appearance of plates inscribed with "wajra" in several mandala-shaped temples, Mahayana Tantrayana Buddhism became the most popular religion. With an area of 3,981 hectares, Muara Jambi Temple is the largest Hindu-Buddhist temple complex in Southeast Asia. It is located on the banks of the Batanghari and is the largest and most extensive on the island of Sumatra, Indonesia. The Muaro Jambi Temple complex is located on the ancient natural embankment of the Batanghari River. The river path crosses this location. The site has 110 temples, most of which are still in the form of unrestored earthen mounds (menapo) (Fitriaty et al., 2021).

In addition, there are several buildings in this temple complex that have Hindu influences. The complex not only has temples but also ancient artificial ditches or canals, water reservoirs, and earthen mounds with ancient brick structures. There are at least 85 menapo still owned by local residents in the complex (Firsty & Suryasih, 2019). This complex not only has building remains but also statues of prajnaparamita, dwarapala, elephant simha, stone umpak, mortar, and stone mortar. Buddhist mantras written on gold paper, foreign ceramics, pottery, large bronze pots, Chinese currency, beads, inscribed, pictorial, and marked bricks, as well as iron and bronze fragments and precious stone statues. In this complex, in addition to temples, mounds (small mountains), which were made by humans, were also found (Sayuti et al., 2022). This small mountain is known as Bukit Sengalo, or Bukit Perak Temple, by the locals. Since 2009, the Muaro Jambi Temple Complex has been proposed as a World Heritage Site by UNESCO (Tamin et al., 2019).

The area along the upper Batanghari River in West Sumatra was also once the site of the development of the Jambi Malay kingdom. Seen from the discovery of Bhairawa and Amogapasa statues in the upper Batanghari, Malay settlements originally originated from the Batanghari river in the Jambi region before moving inland, centered on Pagaruyung, West Sumatra. In the Batanghari river basin, the discovery of Buddhist-patterned archaeological sites and artifacts indicates the existence of communities that supported and developed Buddhism. Between the 7th and 14th centuries AD, Buddhism flourished in Malaysia. In the VII to XII centuries, Jambi and Sriwijaya were inseparable (Bronson & Wisseman, 1978).

The histories of the Srivijaya Kingdom and the Malay Kingdom are almost the same, and both have almost the same territory. Written evidence of Jambi as a geographical area of Sriwijaya is found in the Karangberahi Inscription made by the Sriwijaya Kingdom (Sartono, 1992). Likewise with the Malay people who lived in Muarajambi. Buddhism developed with the help of these two kingdoms in the classical era. The settlement of Jambi is in the right position as an international waterway and shipping route, thus contributing to the growth and development of Buddhism at that time (Utomo, 1992). Geographically, Jambi is located on the east coast of Sumatra Island, with views of the Strait of Malacca and the South China Sea.

Muara Sabak is a major port for international shipping lines and the surrounding hinterland, as it is located between the Strait of Malacca and the South China Sea. The inter-island port of Muara Sabak covers not only Jambi but also surrounding areas such as Riau, Bangka Belitung Islands, West Sumatra, and South Sumatra (McKinnon, 1984). Known as a major producer of various types of spices, this inland region is home to many endemic forest products, such as frankincense, agarwood, laka wood, resin, and medicinal spices such as pepper, areca nut, honey, rhino horn, and elephant ivory. Jambi also produces precious metal mines, gold, and game. Therefore, Jambi became a trading destination for other countries such as China, India, and other countries in Asia such as Persia and the Arabian Peninsula. As a result, the relationship between Jambi and China has been established for centuries through trade.

Archaeological sites in the Berbak Delta near Muara Sabak, such as the Lambur Site, Siti Hawa Site, Olak Badar Site, and Koto Kandis Site, show the relationship between Jambi and China in the VII to XII centuries. Sites along the Batanghari River from downstream to upstream, such as Orang Kayo Hitam, Suak Kandis, Ujung Pelancu, Muaro Jambi, and Pematang Jering, show close ties with China. Chinese ceramics from the Sung Dynasty, the Ming Dynasty, and younger dynasties than the Ching Dynasty can also be found there (Widiati, 1996). All of these locations have deposits of Chinese ceramic findings. Envoys from Jambi came to meet the Chinese emperor, according to Chinese sources. Arab sources mention Jambi as a place of international shipping and trade. In 844–848 AD, an Arab trader named Ibn Hordadbeh visited Srivijaya. He wrote that the king of Zabag was called Maharaja, and his rule included the eastern islands. Other Arab traders, Ibn Rosteh and Abu Zayd, also mentioned the wealth and crops of the land of Zabag. Jambi had connections with India, according to some ancient findings in the Batanghari River basin.

A bronze Dipalaksmi statue was found at the Koto Kandis site on the banks of the Batanghari River. The discovery of this Dipalaksi statue indicates the presence of Indian ships visiting Jambi. Archaeological findings regarding ancient boats found at the Ujung Pelanju Site, Suak Kandis Site, and Lambur I Site show that these ancient boats still used a technique known as the arrangement of planks and boat keels connected by pegs and palm fiber ropes. This shows the role of boats as a means of transportation and shipping in Jambi waters during the classical period. The manufacturing technique combines traditions from Southeast Asia and China (Utomo, 1985).

C. Jambi Malay sultanate settlement

The manuscript that explains the history of the Jambi Sultanate since 700 Hijri, written by Ngebi Sutho Dilogo Priyayi Raja Sari, explains how Islam entered Jambi. Datuk Paduko Berhalo, an Islamic preacher from Istanbul, Turkey, gave an explanation of the entry of Islam. Datuk Panduko Berhalo married Putri Selaro Pinang Masak, the daughter of King Baremah of the Pagaruyung Kingdom (Andaya, 2016). Their ancestors were kings of the Jambi Sultanate, and they had four children. The process of Islamization in Jambi began in the 15th century AD. During this time, the Hindu-Buddhist kingdom turned into an Islamic kingdom. Jambi kings and nobles embraced Islam and built mosques for worship and education (Sagala, 2021). Another opinion about the spread of Islam in Jambi is that an Arab "Alawiyin" named Habib Husein Al Baraqbah from Tariem, Hadramaut, Yemen, brought Islam to Jambi. He started his journey from Yemen to India, then to Aceh and Palembang, before finally arriving in Jambi. He married the daughter of the Malay king, Princess Rajo Bungsu. Trade relations between Islamic countries in the Middle East, India, Persia, and Turkey were some of the factors that influenced the development of Islam in Jambi. This relationship influenced the teachings and culture of Islam in Jambi. Then the Jambi Sultanate, which embraced Islam and implemented Islamic law and government systems, emerged. The role of ulama and mubaligh was in spreading da'wah and Islamic knowledge to the people in Jambi through langgar, maktab, madrasah, and pesantren. In addition, a unique and tolerant Islamic identity was produced by cultural acculturation between Islam and the customs of the Jambi people (Chatib et al., 2011).

Along with its reign, the Sultanate of Jambi, which consisted of various ethnicities, continued to grow. Since the days of the Hindu-Buddhist Malay Kingdom in Jambi, Arabs, Chinese, and Indians have lived there. They played a role in building the sultanate. At that time, Jambi was home to indigenous Jambi people or Jambi Malays, as well as people from other countries such as Java, Minangkabau, and Banjar. During the sultanate, the Dutch East Indies, and after Indonesia's independence, settlements continued to develop. Jambi City became the center of government and the capital of the Jambi Sultanate during the sultanate period. Around the palace, there were also residences for nobles and palace officials, each of which was located at different distances from the palace according to their level of nobility. The upstream and downstream areas of the Jambi Sultanate were controlled by the sultan. Assisted by the Jambi port, Jambi is not only the center of government but also the center of the economy.

For a long time, Jambi Port, which is located on the banks of Batanghari, has been an important trading center. Jambi Port was filled with traders from all over the archipelago and foreign traders who carried out export-import trade (Irawan, 2014). Economic development in the Jambi region besides the Jambi Port is also supported by the Batanghari River. This river connects the Jambi region and even becomes an important means of transportation to transport agricultural products, fisheries, and handicrafts to the capital city.

D. Settlements during the Dutch colonial rule

In the late 19th and early 20th centuries, Jambi became more important politically and economically for the Dutch East Indies. Around Jambi Harbor, the Dutch East Indies government established the offices of the resident, assistant resident, and kontrolir. In contrast, the palace was destroyed after the Dutch army captured it. The Dutch East Indies government then built official houses, also known as elite official houses. Its location on relatively high flat land ensures security, beauty, and cleanliness, and it has luxurious housing facilities and official cars (Budihardjo, 2001). The location of these offices and official houses became the center of the Dutch East Indies government. The Sultanate of Jambi was then incorporated into the Palembang Prefecture by the Dutch East Indies Government in 1901, and became a separate prefecture in 1906. Jambi Prefecture was divided into several afdeelings and onderafdeeling. Onderafdeeling Jambi is a subdivision of Afedeeling Jambi, which is further divided into settlements on the right and left sides of the Batanghari River, as well as settlements in the capital and coastal areas of Jambi. The Dutch East Indies government also made Jambi a city as an economic center by building several economic networks around the Jambi Port, such as trade offices or representative offices, storage warehouses, government-owned bank offices, as well as markets and shops to meet the daily needs and secondary goods of the population. The port location and its surroundings are also the central business district (Karmila, 2011).

As rubber cultivation in Jambi increased and rubber was traded overseas through Jambi Port from the 1920s until just before the world economic depression in 1930, Jambi became increasingly important economically (Wellan, 1932). As almost all small-scale rubber holdings were located in areas with easy river access, the Batanghari River became an important factor in the expansion of smallholder rubber cultivation in Jambi at that time. The river was used to transport rubber that was widely grown in the upstream areas. The increasing frequency of shipping and rubber trade has encouraged economic growth in Jambi City (Margaretha Barus, 2018). This situation made Jambi City a center of population concentration, making it more advanced and developed and characterizing city life. To support the growth of Jambi City, the Dutch East Indies government also built many roads, land transportation, settlements, schools, hospitals, and post offices. The urban focus was more concentrated in the city of Jambi (Lindayanti, 2013). The Tungkal area on the Jambi coast was part of Jambi City during the Dutch East Indies. After Indonesia's independence, Tungkal became the capital of West Tanjung Jabung. The city eventually expanded to the east coast of Jambi. These are the two areas that used to be the onderafdeeling of Jambi in the Dutch East Indies. Currently, the two largest port cities in Jambi are West Tanjung Jabung Regency and East Tanjung Jabung Regency (Ali, 2008).

Developing Stage of Jambi Region Settlements

The Jambi region began to be divided into small zones, such as housing estates or factories, when it was in its teens. As mentioned earlier, two important events occurred after Dutch colonial control of the Jambi Sultanate. The Jambi government was formed by the Dutch colonials with their political power after these events. This period is considered the starting point for the emergence of modern development in the Jambi region in the form of canals in the sultanate related to shipping, agriculture, and defense. The stone buildings that appeared in Jambi during the Dutch administration showed progress in the past (Budihardjo, 2001). In addition, the stone buildings show the condition of settlements at that time, which was related to the stratification of society in the Jambi region. The rich had the privilege of living in houses made of ironwood or tembesu, which were expensive woods. Here, the nobles who came from the families of the kings and sultans of Jambi are referred to as the noble class. In addition to these two groups, people who specifically reside in the Jambi Region are people who work in the industrial sector, known as "toke" from the Chinese ethnic group, and are under the command of superiors. However, some of these members are subordinates; some of them act as leaders of larger groups. The location where this group lives varies according to their occupation (Purwanto, 1997).

At this point, ethnic settlements were organized by race. Because of this organization, locations are designated by race and immigrant ethnicity. Neighborhoods were grouped by race. The sultanate society and colonial administration were centered on the Great River, Sungai Bantang Hari. This expansion divided the river into two parts.

The settlement of Gedang during the sultanate was located on the right side of the river. This was the center of government in Jambi (Zulqaiyyim, 2019). After the Dutch colonial government took control of Jambi, the right side remained under Dutch rule. This further strengthened the suspicion that the Dutch controlled Jambi because the area that was once considered sacred had been controlled. All the facilities needed by the Jambi regency government were built in this place to facilitate the Dutch colonial government. In addition, many Europeans lived in this area (Budihardjo, 2001).

The left side of the Jambi territory was used to eradicate the Jambi nobles and Jambi ethnic groups who were expelled from their territory. The Dutch government gathered the Jambi nobles to live there in order to easily control their economy. In addition, this side of the Batang River is now home to migrants from various countries: Chinese, Arabs, Javanese, Minang, Pelembang, Banjar, and others. They also settled on the east coast of Jambi, where the Bugis people came and settled in Jambi. In addition to showing stratification, this rule was also used to control foreigners who came to the area. Most of them came to the region in the 17th to 20th centuries to trade various types of commodities. They settled along the Batanghari River to the coastal areas of the East Coast of Jambi, such as in the Tungkal and Sabak areas (Pradjoko & Utomo, 2013).

Mature Stage Settlements in the Jambi Region

Well-organized residential areas, commercial areas, and industrial areas indicate the maturity of the area in the third stage. Currently, the Jambi region has been divided based on its function and morphology. Most of the Jambi plains are wet and brackish forests. The land in most places tends to be wet throughout the year and prone to flooding. A collection of land where people live near rivers that flow in the lowlands, the land profiles of the embankments, valleys, swamps, and gutters in this area reflect different ecological variations. The colonial government at least used these different conditions as a basis for understanding modernity in this area. They wanted a more land-oriented development concept. However, the very wet physical conditions of this area made it difficult for the government to conceptualize the land area because it was difficult to determine the right location to build office areas, trade areas, and so on. In fact, before the colonials took power, development had already begun on the mainland of this region, especially in the Pematang area (Budihardjo, 2001).

After the Dutch colonials took control of the Jambi region, they used the pre-existing buildings as residences and partly as defense sites. The water tower, built in 1928, is one of the most striking signs of modernity from this era. The building is a testament to the colonial government's attention to health conditions. They found that the quality of clean water in the area was so poor that they utilized the water tower building as a source of clean water. The colonial government not only wanted to build water towers but also wanted to build infrastructure on land that could provide more sophisticated living facilities (Tideman, 1938). However, the country faced obstacles to regional development due to lack of funds. The paving of roads in the 1920s and the construction of entertainment venues and theaters as a sign of exclusivity were other signs of modernity. Laborers from Java were used to construct the roads and buildings. The large number of lower-middle-class people who came to Jambi to work on development projects added to the diversity of the Jambi population. The colonial government had not yet fully modernized the region (Wellan, 1932). Compared to regions such as Padang, Medan, and Palembang, infrastructure progress was still very slow. The infrastructure built was still concentrated in regional centers and around Western communities. However, the Dutch colonial conquest in 1904 had an impact on the politics and overall growth of the Jambi region (Purnomo, 2020).

The sultanate's palace was demolished, and the housing estate inhabited by the Priyayi was confiscated by the Dutch colonizers. The palace was turned into a residence and fortress for the colonizers and their military forces. Dutch officers occupied housing around the palace that was previously inhabited by the Priyayi. Meanwhile, the Priayi moved to the area around the settlement in the Seberang Jambi area. There was a division of traditional settlements during the Dutch colonial period. Although there were some differences, such as ethnic Chinese and Arabs, the same changes were experienced by foreign residents and local residents (Zulqaiyyim, 2019). The colonial government allowed them to build houses and expand their trading areas into the interior of Jambi. As a result, many ethnic Chinese houses were located near the market. The Arabs, who were better off, had houses made of stone and luxurious pyramid houses. Dutch colonial views and experiences during their stay in the Jambi region became the basis for regional development planners (Aldiansyah & Nareswari, 2019).

Sustainable Regional Development of Jambi East Coast Port City

Eventually, the Jambi people moved to coastal areas. There was a decline in the role of rivers as ethnic settlements at the end of the 20th century. The physical development of the Jambi region was also influenced by changes in the concept of the region over time. The ideas that emerged during each period of government influenced these developments. The development of the Jambi region was also influenced by the shift in people's habits from river life to land life. Currently, the welfare of people in the Jambi region is also inseparable from where they live. People who live near the river are considered to have a lower level of welfare than people who live far from the river (Asnan, 2016). The eastern coastal area of Jambi has rapid settlement development. During the sultanate and Dutch colonial periods, this area was only a road to the main area of the city of Jambi Harbor. The number of ethnic communities was also limited. The role of coastal Jambi as a port city was strengthened following local political dynamics after Jambi became a province in 1957 (Ali, 2008). The leaders of the east coast of Jambi fought for the independence of Jambi as a province and wanted economic equality. To achieve equity, Tanjung Jabung Regency was established in 1965. This step was taken to fully support the development of the east coast (Lindayanti & Witrianto, 2014). As the region grew from a sub-district to a regency of great influence, infrastructure development that was once limited became very flexible. The port city on Jambi's east coast developed thanks to the construction of offices, ports, markets, schools, hospitals, and land routes. The east coast of Jambi became crowded with settlements of various ethnicities due to these developments (Maroky et al., 2011).

Starting in 1967, Javanese people came to Rantau Rasau, and the transmigration program helped to increase the population. They were not only Javanese but also Banjar, Bugis, Ambon, Bali, and Chinese. In the seaport area of Jambi, various religions such as Christianity, Catholicism, Confucianism, and Buddhism emerged and developed (Haeran, 2020). Nearby mosques, churches, and temples show ethnic harmony with various beliefs, reflecting interfaith harmony and tolerance. The slogan "one paddle together to the destination" shows a shared commitment to advancing the east coast port city of Jambi. This slogan symbolizes the cooperation of people from various ethnicities and religions to improve the welfare of the city. The seaport city of Jambi continued to grow so that in 1999 the administrative area of Tanjung Jabung Regency was divided into two: West Tanjung Jabung Regency (functioning as the parent regency) and East Tanjung Jabung Regency (a result of expansion) (Hartadita, 2015).

Sustainable development planning on the east coast of Jambi is accelerated by the presence of this port city. In the spatial development plan of Jambi Province, the highlands function as a source of raw materials, the central part as a production area, and the east coast as the main distribution area. Around the east coast of Jambi, a tidal farming system has been implemented, which increases opportunities for settlement growth in the Jambi seaport city area. In addition, the east coast of Jambi is home to various plantation commodities, including areca nut, coconut, oil palm, rubber, and marine fishery products. Jambi's east coast marine fishery products are the main source of food for the Jambi Province region. It has a paper and wood processing business. The mining sector, especially the oil and gas mining sector, is the most superior in the Jambi east coast seaport city (Hartadita, 2015).

Jambi Province receives the largest financial contribution from the coastal port cities of the East Coast of Jambi. The two ports are very active in supporting sustainable development planning. The two ports are Tungkal Port and Sabak Port. Tungkal Port receives goods and passengers, and Sabak Port receives goods from all over Sumatra as well as from other countries. The east coast port city of Jambi has a very strategic position because it is in front of the economic growth area known as the Indonesia, Malaysia, and Singapore Growth Triangle (IMS), as well as close to the Singapore, Batam, and Johor trade cross-region (SIBAJO). Most of the eastern coastal areas of Jambi are growing settlements. In the end, this area became the center of Jambi's transportation by sea (Hutchinson & Chong, 2013).

Conclusion

The sustainable settlement pattern of the Jambi port city community from ancient to modern times is an ethnic identity that continues to develop from before and after the influence of the Hindu-Buddhist period, the Islamic period, the Dutch Colonial period, and the independence period. Based on the search for archaeological, historical, and toponymic findings on inscriptions, also verified through searches and research, there are currently areas that were once ancient to modern settlements. The area of small and large rivers, including the Batanghari River is a settlement that has had a great influence on civilization with the establishment of the Jambi Malay Kingdom,

which has a government, such as the Jambi city area and Muaro Jambi. This is supported by many archaeological findings and sites, such as the discovery of temples and settlement sites. Muaro Jambi is an area with a very dense settlement and is the largest temple complex in Southeast Asia, with an area of 3,981 hectares, precisely on the edge of Batanghari.

The existence of ancient settlements in cities and regencies in Jambi Province to this day is evidence of the local community's ability to protect the environment. The distribution of settlements in the Jambi region in the past has taken into account the potential and natural conditions of the environment. In terms of geohistory, ancient settlements in the Jambi region are located in the highlands near the Batanghari River area, which has a very strategic position and was very influential as a settlement area during the Ancient Malay period in Jambi, 7–13 centuries AD, whereas, the coastal area, especially along the watershed to the east coast of Jambi, is an area that has experienced development and has developed into the economic center of Jambi. The formation of port cities such as West Tanjung Jabung Regency and East Tanjung Jabung Regency. Both of these areas are multiethnic settlements and continue to develop into large port city areas, accelerating the economic development of Jambi Province. In the 15th century, Islamic proselytizing from Turkish and Arab preachers began to enter Jambi, transforming the Hindu-Buddhist kingdom into the Sultanate of Jambi, which embraced Islam. This shift marked a major change in the social and religious structure of Jambi society.

The entry of the Dutch in the late 19th and early 20th centuries brought another major change. Jambi became politically and economically important to the Dutch East Indies. The Dutch established a resident's office, elite official houses, and a government center around Jambi Port, turning it into a significant trading center. The rubber trade became the backbone of Jambi's economy during this time. Jambi's cultural diversity is also the result of acculturation between indigenous people and immigrants from India, China, Arabia, and other nations. This acculturation shaped Jambi's unique identity, which can be seen in the development of religion and culture in the region.

During this colonial period, the Dutch government implemented a special policy towards the Jambi Sultanate and ethnic Jambi Malays, giving them a certain space and place. However, if there were policies or actions that were not in line with the wishes of the Dutch government, some groups chose to leave the region. The eastern coastal region of Jambi became very heterogeneous due to the migration of Bugis, Banjar, and Minang people. These ethnicities supported the Jambi Sultanate due to strong trade relations. Jambi Port, located on the east coast, became the center of this activity.

This regional heterogeneity developed because of the colonial government's policy of giving space to the Jambi Sultanate. The sultanate family was given an area that could be controlled by the colonial government. If they could not be tamed, they would go to inland areas such as Bangko, Tebo, Bungo, and Sarolangun. However, the east coast remained part of the Sultanate's territory. Some people chose to migrate to other areas, including Sabak.

Jambi Malays who disliked segregation, tended to spread out, thus adding to the heterogeneity of the region. In addition to tribes such as the Tungkal, Minang, Banjar, and Bugis, Javanese were also imported and employed in the Jambi Sultanate area. In contemporary times, during the independence period, the territory of Jambi City was administratively restricted. Nevertheless, the coastal areas in the contemporary period still maintain and uphold Jambi Malay customs.

Jambi's rich natural resources, such as gold, forest products, and spices, made it a trading center that attracted traders from various countries. The port of Muara Sabak and the Batanghari River became important routes for international trade. Overall, the history of Jambi shows a significant transformation from a simple agrarian society to an important center of trade and government, influenced by various aspects – religion, culture, and colonial powers.

Through this research, policies are needed to support the socialization of ancient settlements in Jambi so that they do not lose their history and identity. Ideally, there are central and regional regulations that provide a binding legal umbrella for regional development, especially in Jambi and Indonesia in general, so that development does not encroach on cultural and historical aspects. Jambi is the core of the Malay community in Indonesia.

However, this paper has several limitations. First, the research used primary sources in the form of written literature. The sources used are colonial literature such as staatsblad and research results, both in the form of reports and books. Previous studies, which contained reviews related to what is discussed in this research, were also used. As for the post-independence period, sources from both central and regional governments were used. This research has not used oral sources in the form of oral tradition or oral history. Secondly, there is the potential that this research looks at the outlines of both spatial and temporal aspects. The spatial aspect of this research discusses settlements that later became cities. Meanwhile, the temporal aspect of this research is historical research with a very long period of time, starting from pre-Hindu-Buddhist, to Hindu-Buddhist, Islamic, colonial, and post-independence.

Despite the limitations and shortcomings, this research attempts to provide a picture and explanation of settlement transformation over a long period of time. Future research or studies on settlements in the areas mentioned in this research are still very wide open, including even small ethnic settlements, for example, settlements based on ethnic communities include riverbank settlements, inland, upland, coastal, and harbor settlements. Of course, there are still many aspects that can be explored in the various communities and settlements in Jambi, which are also enriched by traditional and oral sources.

Conflict of Interest

The authors declare that they have no conflicts of interest.

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Experimental teaching status of biology knowledge of natural science subject for 7th grade at some secondary schools in the Mekong Delta

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Abstract

Practical experiments are an indispensable part of the student's learning process. Students also have the opportunity to develop their skills when participating in practical experimental activities. Thus, the study investigated the status of teaching practical experiments on Biology knowledge in the Natural Science subject 7 in some Secondary schools in the Mekong Delta. Previous studies on laboratory practice had only focused on specific aspects and did not provide a general and comprehensive view. The project used survey and data analysis methods with 31 teachers surveyed at secondary schools in the Mekong Delta. The study showed that most teachers assessed the capacity for laboratory practice and clearly understood the primary purpose of laboratory practice. Teachers used the internet as a leading source of information for reference. Blended teaching was a popular method and was favored by teachers. Teacher evaluations showed that the training was efficient, although secondary school facilities and equipment were still limited. Gender and age factors did not significantly affect teachers' perceptions of students. Teachers' lesson plans were prepared according to official dispatch form 5512 to develop students' abilities. Recommendations in the article included regular teacher training and investment in school equipment and facilities. These recommendations emphasized strengthening teachers' professional capacity through regular training and improving facilities to support teaching and learning activities.

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Introduction

An experiment is a part of objective reality that is performed or recreated under special conditions, in which people can actively control the factors that affect the process to serve their goals significantly and help people verify and clarify scientific hypotheses. Experiments are used as a teaching method. Through experiments, learners discover scientific knowledge and develop the ability to practice experiments. There are many experiments, and every kind of experiment has a specific role in teaching. Research-oriented experiments are essential in creating the capacity for students to practice experimentally (Meier & Nguyen, 2016). Moreover, the teaching experiment is a variation of the interview technique. It incorporates three components: modeling, teaching episodes, and individual or group interviews. The most important aspect of the teaching experiment is the modeling of the students' responses into a coherent picture of the students' progress over an extended period (Steffe et al., 2000). Biology is an experimental science because knowledge about the structure, function, and biological processes is drawn from observation and experimental research results. Experiments bridge theory and practice, helping foster students' qualities and abilities (Pham & Le et al., 2020). Experiments in teaching biology are crucial tools to help students deepen their knowledge practice and improve their practical skills. Therefore, experiments are one of the specific methods of teaching students (Nguyen & Hoang, 2019).

The importance of experimental practice, especially experimental practice of biological knowledge, is crucial for students. As we can see, it plays a vital role: experiments help students develop practical and problem-solving abilities through experimentation, help students develop the ability to work independently or in groups, and create interest in learning and passion for scientific research (Do, 2023). In addition, in Biology teaching, besides cultivating reasoning skills, it is necessary to focus on developing experimental thinking skills for students. The use of experiments in teaching could promote active learning and enhance students thinking abilities and biological competencies (Bui et al., 2020).

Although the importance of experimental practice is indisputable, this is a new Ministry of Education and Training program, but there has not been much research on the practical teaching of natural science and biological knowledge in grade 7. Therefore, in this article, we discuss the current status of teaching practical experiments on Biology knowledge in Natural Science subject 7 in some secondary schools in the Mekong Delta region to promote the values of experimental practice.

Literature Review

Some studies related to biological experiments show that using exploratory experiments in teaching biology helped teachers achieve new teaching goals (forming and developing general competencies and Biology competencies), promote authentic learning, and change the learning environment to benefit students (Bui et al., 2020). Through experiments, students actively explore, discover, and solve cognitive tasks and flexibly and creatively apply knowledge and skills (developing the ability to detect and solve problems) (Pham & Dang et al., 2020). In teaching natural sciences in general and biology in particular, experiments are a positive and effective teaching method for students' awareness and capacity development, especially natural capacity (Do, 2023). The study "The Current Situation of Practical Teaching in Biology at High Schools in the Mekong Delta and Ho Chi Minh City" by Tran and Nguyen indicated that 100 percent of the Biology topics from the practical exercises in the textbooks for grades 10, 11, and 12 were selected by teachers for instruction, with some topics in grades 10 and 11 being chosen with high frequency. In grades 10 and 11, the topics taught in practical sessions accounted for a relatively high proportion compared to grade 12. Most teachers recognized that practical teaching and experiments played a crucial role in developing students' Biology knowledge. However, implementing practical teaching and experiments in Biology at high schools faced many challenges, such as a lack of facilities, insufficient reference materials, limited funding, and overwhelming workloads (Tran & Nguyen, 2021).

Not only in Vietnam but around the world, the use of biological experiments is also prevalent. According to the study by Martins-Omole, using experiments to teach biological concepts significantly improved the performance of middle school students compared to using other teaching methods (Martins-Omole et al., 2016). Baker (2023) states, "Experiments in education went beyond the traditional complex classroom, providing students with hands-on experiences that fostered critical thinking, problem-solving, and a deeper understanding of the subjects they studied. Experiments turned passive learning into active participation.

The teacher continued collecting information from the textbook or lesson while students actively participated in the learning process. This hands-on approach allowed students to interact with concepts, materials, and equipment, making learning more relevant and memorable". Experimental teaching could be defined as a process involving a procedure to support the assumptions made. Procedures required hands-on activities that engaged and motivated students to learn in the science classroom (Doherty, 2011).

"Significant in practical science teaching, learning, and summative assessment, the underpinning model of scientific methods is based on a relatively simplistic and linear account that does not represent how scientists did practical work. This paper examines how science teachers in England and Wales view scientific methods included in teaching and summative assessment of practical science" (Ioannidou et al., 2022). The basis for the Biology syllabus and the accompanying laboratory work is the translation of the textbook Biological Science: Molecules to Man (BSCS – Blue version, 1968) into Slovene. New, active methods were introduced into the teaching of Biology, and specialized laboratories with standardized equipment were established in schools (Šorgo & Kocijančič, 2012). This paper explores the teaching strategies of secondary school biology experiments based on VR technology. In this paper, VR technology is applied to biology experiment classes in secondary school to improve the effect of biology experiment classes, especially to cultivate the experimental operation ability and the ability to construct biological experiment knowledge (Xia et al., 2020).

From the research that was done, it could be seen that biological experiments were given great attention not only in Vietnam but also worldwide. The benefits of experimental practice increased the value of teaching experimental practice. Since then, there have been many studies on experimental practice to understand its importance more clearly. However, the above studies only focused on specific aspects and did not provide a general and comprehensive view of the current status of biology experiment practice. In the Mekong Delta region, teaching practical Biology experiments remained a challenging problem due to insufficient research. Therefore, this study presented the current situation of teaching practical experiments of Biology knowledge in Natural Science subject 7 in some secondary schools in the Mekong Delta.

Methodology

Survey subjects: Teachers who taught the Natural Science and Biology knowledge subject 7 at some secondary schools in the Mekong Delta region.

Survey tool: The survey form was used to survey the current status of teaching practical experiments of Biology knowledge in Natural Sciences 7 in teaching at some secondary schools in the Mekong Delta region. The survey, comprised of part 1, asking questions related to the survey subject, such as full name, seniority, and gender. Part 2 involved assessing capacity practice experiments with questions surrounding the purpose and nature of teaching experimental practice. Part 3 provided information about the teachers' training participation process. The final part organized experimental practice with questions about location, duration, equipment, methods, and teaching skills. The topic used the survey method. Survey research was a form of quantitative and qualitative research that identified a sample, collected data through written questionnaires or interviews, and drew conclusions or inferences about the subject being surveyed (Kuada, 2012).

Sampling criteria: The author conducted interviews using a questionnaire with teachers of Natural Science who taught Biology according to secondary schools' 2018 general education curriculum. The questionnaire was sent to the survey participants based on a non-probability sampling technique known as convenience sampling. This sampling technique involved randomly selecting elements that the author could easily access.

Data analysis method: After collecting enough expected data samples from the research target group of the topic using a questionnaire, the data were cleaned and processed using specialized software Jamovi v.2.6.44. The data analysis reflected the types of questions or hypotheses the research intended to address. The study included recording response rates, checking the standard deviation of responses, and conducting descriptive analysis of all items. Moreover, the Mann-Whitney U test was used to compare the difference between the means of evaluations by gender (male and female) and seniority ($\geq$ 10 years and < 10years).

Measuring the reliability of questionnaires: The Cronbach Alpha was used to assess the reliability of survey questionnaires (Cronbach, 1951). This method is successfully used in evaluating the quality of human resources according to the requirements of enterprises in the Mekong Delta (Quan et al., 2012).

Results and Discussion

The Reliability of the Questionnaire

The Cronbach's Alpha analysis showed a value of 0.829, indicating that the questionnaire exceeds the reliability threshold of 0.6, demonstrating good internal consistency. This suggests the items are well-correlated and consistently measure the intended construct, minimizing random error and improving data precision. While the reliability score is strong, it does not ensure the questionnaire's validity, meaning it may consistently measure something other than the intended construct. Further validation, such as factor analysis or content validity checks, is needed to assess the instrument's quality fully. Thus, the questionnaire is reliable, but additional steps are required to confirm its effectiveness.

General Information about Survey Participants

The research team asked survey questions mainly about assessing laboratory practice capacity, participating in training, and organizing laboratory practice teaching to survey the current state of teaching Biology knowledge in Natural Science subject 7 in some secondary schools in the Mekong Delta region.

The survey was conducted with a convenience sample of 31 participants, with female teachers accounting for 77.4 percent and male teachers accounting for 22.6 percent. Teachers participating in the survey had high seniority and rich teaching experience. Information on survey participants is represented in Table 1.

Table 1 General information about survey participants

Category		Numbers	Percent (%)
Sex	Female	24	77.4%
	Male	7	22.6%
Seniority	< 10 yrs	12	38.7%
	≥ 10 yrs	19	61.3%

Assessment of Experimental Practice Capacity

When conducting the survey, the research team noted that the purpose of experimental practice was that most teachers chose to teach experimental practice mainly as *"Verifying the correctness of learned knowledge; Is an important part of finding new knowledge; Enhance interest in learning the subject; and shorten the gap between theory and practice"* with a rate of 71.9 percent. According to the study by Hoang & Nguyen (2007), "The experiment meant the act of exploring and seeking in practice to draw conclusions about prior predictions or to answer questions in one's thoughts." This was a good sign because most teachers understood the primary purpose of teaching experimental practice. These positive signals helped teachers design lesson plans and implement appropriate teaching activities, thereby creating an effective learning environment to meet students' needs and the curriculum's educational goals. When asked about the information channels that teachers used to refer to and learn about teaching practical experiments, up to 90.3 percent of teachers chose to use the Internet/social networks, 74.2 percent learned from colleagues, the remainder was through training and through books, reports, and magazines, with an equivalent ratio of 51.6 percent (Figure 1). In today's increasingly developing society, the internet was no longer strange to us. Everyone at home, from rural to urban areas, used the internet, so this result was nothing new. Surprisingly, the Internet/social networks accounted for the highest proportion, as author Ngo Van Thap concluded: "Using the Edmodo learning social network in teaching brought many benefits and effectiveness when faced with the need to innovate and improve teaching quality." (Ngo, 2017). Learning through peers accounted for the second-highest rate because each individual had different experiences, so teachers could learn from each other's experiences, according to Sanit Srikoon's research: "Today's teachers were called upon to work with colleagues to design learning environments that promote deeper engagement in learning as a reciprocal process." (Srikoon et al., 2018). However, training was one of the lower options, possibly due to a lack of resources and infrastructure, time constraints, and teaching plans, or some education systems not having clear and strategic professional development plans to improve teaching capacity in laboratory practice.

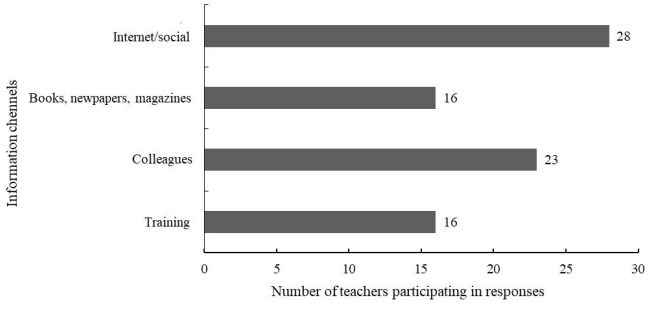

Figure 1 The information channels that teachers used to learn about the practical experiment teaching model

The Process of Participating in Training on Teaching Practical Experiments on Biological Knowledge in Natural Sciences 7

The data showed that trained teachers accounted for 61.3 percent, while untrained teachers accounted for 38.7 percent. It could be seen that training was vital because its benefits helped teachers improve their abilities and meet students' diverse learning needs, optimizing each student's learning efficiency. The authors emphasized the importance of training: "Training managers and teachers was a regular, continuous, long-term job to build a team with sufficient quantity, appropriate structure, and high quality, serving the development strategy of the school and industry. On the other hand, training remained urgent when the education and training industry faced many pressures and demands from leaders, parents, students, and market requirements. Labor increasingly demanded human resources" (Phan & Pham, 2020).

Among the forms teachers chose during training, the combination of online and face-to-face was selected by teachers the most, with a rate of 57.7 percent, followed by online-only (26.3%) and face-to-face (16.0%). A combination of online and face-to-face training could maximize flexibility and interactivity. This meant that during the training process, teachers could be flexible in their schedules and study whenever they felt it was appropriate, saving preparation and travel time. Learning methods and skills during online learning also helped teachers grasp the necessary knowledge. During face-to-face sessions, teachers could participate, practice, and discuss topics, skills, and expertise. Furthermore, teachers could discuss and share experiences throughout the learning process to ensure that everyone had the opportunity to access content effectively and apply it in practice.

Teachers' issues were often about teaching methods and skills when participating in training. Improving teachers' practical skills and expertise was also an important focus. Furthermore, enhancing skills and developing students' capacities and qualities were also teacher training areas. Some typical comments about the training content included: "Organizing experimental practice activities in class with active methods such as teaching based on scientific exploration, following the technical design process, teaching based on practical problems, activity creative experiences, career-oriented education and expanded science experiences for students." - opinion of a teacher from Ham Ninh Secondary School, "Subject knowledge, how to guide students to practice experiments to master knowledge, skills,..." - opinion of a teacher from Tan Thuan Secondary School, "Theory, practical content, practice instructions for students, safety rules in the laboratory" -opinion of a teacher from Viet My Secondary School.

Most teachers thought the training was more or less effective, with very few teachers considering it ineffective. This was explained by teachers at Ham Ninh Secondary School, Le Quy Don Secondary School, and some other secondary schools: "It was an opportunity for teachers to share experiences and skills during the implementation process at their units", "It offered teaching methods and experimental teaching sessions", "I think yes, because we also gained more visual insight into this work.". Some opinions suggested that while the training had not brought positive effects, it still provided knowledge, skills, and experience: "It is still there, at least it still provided more knowledge, skills, and experience for myself.". Not only did it help teachers, but students also benefited from the methods and skills applied by teachers in teaching: "Those training sessions were effective for teaching because students practiced several basic skills to learn and explain phenomena, prove practical problems with scientific evidence through proposing problems and planning implementation, plan implementation, report presentation, and discussion. From there, we helped students develop general abilities, specific abilities, and qualities in Natural Sciences.". Teachers also explained some reasons why the training sessions were not practical: "Low effectiveness, because the training format did not fully meet the trainer's requirements", "No, because it was too theoretical", and "Not effective, nor did it meet the 2018 General Education Program." Some mentioned that they could not apply the training content at their work units due to infrastructure limitations: "Less effective because of short time and insufficient experimental equipment."

Teachers rated the knowledge and skills learned during the training process as highly applicable at 64.2 percent, with 17.9 percent rating them as not highly applicable or normal (Figure 2). No percentage indicated that the knowledge and skills could not be applied.

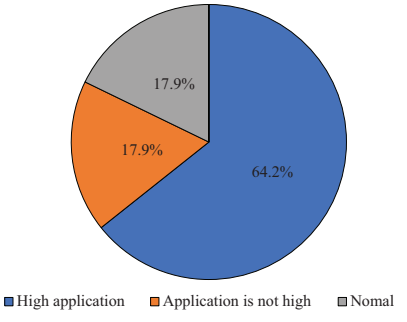

Figure 2 Applicability of training

In the study "Current Situation and Solutions to Improve the Quality of Practical Experiment Teaching in Biology at High Schools in Da Nang City" the author Truong suggested that "It was necessary to regularly organize training sessions on teaching skills in practical experiments for Biology teachers at high schools. This created favorable conditions for teachers to practice their experimental skills" (Truong, 2012). This showed that training was essential in the teaching process, bringing many significant benefits, such as improving the quality of education and career development and having a tremendous positive impact on student learning and development.

From the above opinions, teachers' suggestions for better training sessions were primarily about teaching methods and skills: "To make the training session better, the presenters should have answered the students' questions, and the knowledge and skills trained during the training process could meet current job needs.", "Provide good teaching sessions, easy-to-understand teaching methods, and what should you pay attention to from experience when teaching this practice lesson?", "Talking more about reality than theoretical basis. There are experimental classes for teachers to practice and observe, which should include situations and solve situations that arise during the teaching process". Regarding equipment and infrastructure, suggestions included: "Discussing a lot about solutions to overcome difficulties in the lack of practical teaching equipment", "I think there needs to be more support in terms of equipment and financial resources to be able to carry out this work well in real schools like classrooms". Finally, in response to the 2018 General Education program, the feedback was as follows: "Should organize a training program on experimental practice, should diversify the content and form of organization, be suitable and meet the 2018 GDPT program."

The Process of Organizing, Teaching, and Practicing Experiments

In organizing teaching, the teaching location was one of the crucial factors determining the effectiveness of the teaching process. Teachers chose the laboratory as the place to organize practical teaching with the highest rate of 84.0 percent, followed by the classroom with the second highest rate of 53.0 percent. The school's natural environment, garden, and the research center accounted for 34.0 percent, 22.0 percent, and 9.0 percent, respectively. The laboratory was used the most because it was fully equipped with specialized equipment, conveniently located, and highly safe and secure, helping students focus on their studies. Regarding the laboratory, each class had many students, ranging from 40 to 45 students, so the laboratory space could not accommodate enough students. Therefore, teachers chose classrooms instead of laboratories to organize teaching. As for the remaining locations, most did not guarantee the conditions related to the lesson, so teachers did not choose them. Some problems occurred, such as insufficient physical conditions, lack of training in practical teaching, or students not being active in the learning process, which caused the amount of time spent teaching experiments to be limited, not enough to account for 50 percent. A portion of teachers chose modern teaching time as sufficient, accounting for 4.6 percent; no opinion accounted for 6.3 percent, depending on the actual lesson content accounted for 3.1 percent, and there was no percentage for residual teaching time. The study by Kirschner & Meester (1988) indicated that "such an analysis could function as a framework into which laboratory work could be used as an efficient, effective, and scientifically meaningful educational tool".

Teachers rated teaching equipment as lacking and missing some tools, accounting for the same percentage of 34.4 percent, while 21.9 percent rated the equipment as adequate, and nearly none rated it at 9.4 percent. This was an alarming sign because teaching equipment is quite essential in the teaching process, but high schools in Vietnam still lacked this equipment, as evidenced by Nguyen: "This result showed that the teaching equipment being used in secondary schools today was still not modern; much teaching equipment was old and outdated, thus not meeting the goal of developing learners' capacities in the context of rapidly evolving science and technology. This reduced teachers' motivation to teach and students' motivation to learn, and it wasted money and time invested in using these teaching devices." (Nguyen & Duong, 2021).

The average level of student learning, assessed by teachers with less than ten years of experience (3.67 ± .23) and teachers with at least ten years of experience (3.50 ± .14), showed no difference. The difference was not statistically significant (Mann Whitney U, Z = -.168, p = .867) in Table 2. The reason was that regardless of a teacher's seniority, the perspective and ability to evaluate student learning were similar, based on expertise and observation. Regarding gender, the average ratings of male teachers (3.71 ± .18) and female teachers (3.63 ± .15) also did not show a statistically significant difference (Mann Whitney U, Z = -.196, p = .845) in Table 3. This was because this assessment was often based on standard criteria and evaluation methods independent of gender.

Table 2 Teachers' views on students' level of knowledge acquisition based on seniority

Code	Content	Mean ± SE		Mann Whitney U
		< 10 yrs	≥ 10 yrs	
Q15	The level of knowledge acquisition of students	3.67±0.23	3.50 ± 0.14	Z = -0.168, p = .867

Table 3 Teachers' views on students' level of knowledge acquisition based on gender

Code	Content	Mean ± SE		Mann Whitney U
		Female	Male	
Q15	The level of knowledge acquisition of students	3.63 ± 0.15	3.71 ± 0.18	Z = -0.196, p = .845

When teaching experimental practice, most teachers chose to prepare new lessons according to official dispatch form 5512, which determined appropriate activities to propose experimental practice activities in lessons, accounting for 62.5 percent. Only 37.5 percent of teachers chose to prepare separate lessons and did not follow a template but instead followed a process: Determining specific biological capacity goals → Determining appropriate experimental content and methods → Designing and organizing experimental practice activities towards developing specific biological capacity → Learning to self-evaluate results → Reviewing, evaluating, and adjusting plans. Applying official dispatch form 5512 helped improve the quality of experimental teaching and practice by ensuring that experimental activities were conducted correctly and according to scientific standards. This allowed students to understand scientific concepts better and develop practical skills. However, in the research article by the author Pham Thi Hong Tu, *a process was proposed to organize teaching and practice experiments to develop biological capacity, including five steps: Determining specific biological capacity goals → Determining appropriate experimental content and methods → Designing and organizing experimental practice activities towards developing specific biological capacity → Learning to self-evaluate results → Reviewing, evaluating, and adjusting plans* (Pham & Dang et al., 2020).

Among the general competencies, teachers focused on when teaching practical experiments were autonomy and self-study capacity at a rate of 65.6 percent, communication and cooperation capacity at a rate of 62.5 percent, and problem-solving capacity and creativity at a rate of 59.4 percent (Figure 3). In general, teachers were very focused on developing students' abilities, aiming to improve academic achievement and develop their skills and capacities. Therefore, the rates of students' capacity development were similar, which was a positive sign.

Conclusions and Recommendations

The research results provided insights into the reality that most teachers understood the purpose of teaching experimental practices and used the internet as their main source of information for learning. The proportion of teachers who participated in training was significantly higher than those who did not, with the blended learning format of online and in-person classes being the most popular. Most teachers affirmed that the training was effective and highly applicable. However, the current challenge was that secondary school infrastructure and equipment still did not adequately meet the teaching needs.

This study not only highlighted the current state of teaching experimental practices but also proposed specific solutions to improve the situation. In this article, suggestions were offered to enhance teacher capacity and expertise. Regular training sessions were deemed crucial, as most teachers found them practical and beneficial. Presenters were encouraged to address participants' questions to improve these sessions and ensure that the knowledge and skills imparted were relevant to current job requirements. Investing in school equipment and facilities was essential for effectively teaching practical experiments. However, this study may have potential limitations of the survey method, such as response bias and the inability to establish causal relationships between variables. In addition, the survey scope is limited regarding the number and perspectives of survey respondents.

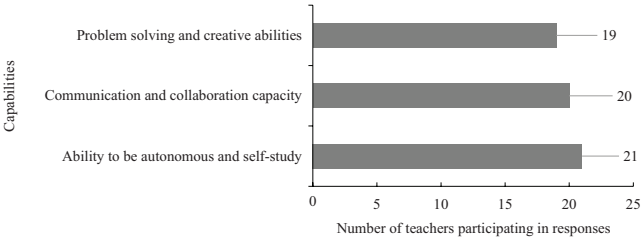

Figure 3 Competencies are chosen by teachers for teaching

Conflict of Interest

The authors declare that there is no conflict of interest.

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Developing indicators of executive functions in preschool children at 3–4 years in Thailand

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Abstract

The objective of this study was to develop executive function indicators for Thai children aged 3–4 years. The study methodology was designed to improve executive function indicators and assessment tools. The research participants in this study were 389 children from 18 schools in 6 regions of Thailand. The samples were determined using multistage sampling. The instrument used to collect data was an executive function assessment form. Data were analysed using second-order confirmatory factor analysis. Regarding executive functions in preschool children aged 3–4 years, there were 3 components and 9 indicators, consisting of: (1) working memory with 3 indicators: memorizing and recalling, bringing information to use in a timely manner, and linking ideas; (2) inhibitory control with 3 indicators: restrained interests, resisting interference, and suppressing needs; and (3) cognitive flexibility with 3 indicators: adapting behavior, adjusting action plans, and changing needs. The confirmatory factor analysis showed that the model fit the empirical data ($\chi 2 = 27.95$, $df = 21$, p value = .14, ($\chi 2/df = 1.33$, GFI = 0.98, AGFI = 0.97, RMSEA = 0.03, and standardized RMR = 0.02).
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Introduction

In the 21st century, our global society has changed, developed and modernized in all aspects such as the economy, society, culture, politics, technology, and public health. People have been affected by these changes and should be equipped with the knowledge and competency needed to live within the changing society. Ngamvirojcharoen (2020) said that what we do today will affect future living. If we want a better life, we need to get ready to deal with the harsh times ahead and deal with unpredictable situations by controlling our emotions, practicing being thoughtful and reasonable and properly acting in relation to them. Hence, it is important to properly develop today's children as they are our country's future destiny. These contexts pose

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challenges to how people live. We must ensure children and youth can safely adapt to the changing environment, learn effectively, and tolerate unfamiliar circumstances.

Executive functions (EFs) are crucial for achieving success in academic life, work, health, and family relationships. Children need to develop these brain function skills from an early age. These skills will provide them with appropriate tools to face challenging situations, helping them to consciously control their thoughts, actions, and emotions. The brain of preschool children develops rapidly. If it is not properly stimulated, or if undesirable behaviours are identified and not corrected from a young age, it can lead to behavioural problems later in life. Examples include social issues such as aggressiveness, drug abuse, dropping out of school, and other related problems (Chutabhakdikul et al., 2017). If there were behavioural assessment tools that indicate EFs, it would help identify problems more precisely. Furthermore, if problematic behaviours are detected during childhood, they are easier to correct compared to other stages of life.

In Thailand, there are very few studies on EFs indicators in preschool children. While foreign countries have already developed EFs behavioural assessment tools, they often include a large number of behavioural indicators that may not be suitable for the context of children in Thailand. Therefore, this study aims to develop indicators of EFs for Thai preschool children aged 3–4 years. This will help create tools for collecting and analysing behavioural data. Ultimately, those tools will lead to the design of classroom learning activities and child-rearing practices that effectively stimulate EF functioning.

Literature Review

This study focuses on developing EF indicators and has conducted a review of relevant literature to create the following conceptual framework:

The Concept of Executive Functions

Executive Functions (EFs) are abilities resulting from the functioning of the frontal lobe. These abilities help control thoughts, emotions, and actions, allowing for appropriate behavioural expression. Goal-directed behaviour refers to behaviour that expresses EFs. Recently, numerous EF skill studies and research involving preschool children have focused on various activities such as storytelling, music and body movement, scientific experiments, creative arts, computerized training, non-computerized games, physical activities and mindfulness training (Diamond & Lee, 2011; Morton, 2013; Sokolovic, 2024). These activities are helpful in supporting and developing children, enabling them to learn by doing, thinking, and solving problems in various situations related to their development.

Currently, scientists have not reached a consensus on all the functions of EF. Hendry et al. (2016) stated that it consists of 4 aspects: attention control, self-regulation, processing speed, and cognitive flexibility. Hargraves (2022) mentioned that it comprises 3 aspects: attention and inhibition, working memory, and cognitive flexibility. Wiebe et al. (2011) suggested that it consists of 2 aspects: working memory, and inhibition. Furthermore, the Center on the Developing Child at Harvard University (2011) suggested that 3–4 year old children needed to use their working memory function of the EF components. This provided children with the ability to memorize 2 rules and follow them. For cognitive flexibility, children should have information to make decisions in different situations. If the data they had did not meet the target, there were alternative methods. To achieve the goals, the children needed to have the ability to recall memories. The ability to resist distractions and impulses while doing tasks leading to goal attainment was inhibitory control. The abilities mentioned above are functions of EFs (Howard & Melhuish, 2017). In summary, 3 components of the executive functions were found in preschoolers. They were: (1) working memory, (2) inhibitory control, and (3) cognitive flexibility. These components formed the basic data leading to improvements in the behavioural indicators.

Working Memory (WM) is composed of various types of behavioural indicators. These include recalling information to use it (Wiebe et al., 2011), memorizing and playing by the rules (Center on the Developing Child at Harvard University, 2011), memorizing pictures and their details (Howard & Melhuish, 2017), storing data in the brain and using it, providing a child with the ability to read, collecting data, recalling it in order to answer questions (The Understood Team, 2021), and managing metacognition indicators (Chutabhakdikul et al., 2017). Additionally, Rangsiyanon et al. (2019) suggested that memorizing data had to be meaningful and that storing the data needed to be done by connecting it to previous experiences in order to process it and use it when needed. It is important to provide a child with a life that has enough information to help them understand things.

Inhibitory Control (IC) allows an individual to repress their impulses and natural, habitual, or dominant behavioural responses to stimuli (Hendry et al., 2016; Phillips-Silver & Daza, 2018; Wiebe et al., 2011). It enables one to think before acting, stop behaviour that is bothering or troubling others, cease muddling, concentrate on tasks, control emotions, and overcome both extrinsic and intrinsic needs and stimuli. All of these abilities help one achieve success (Chutabhakdikul et al., 2017). These capabilities help a person avoid distractions and communicate appropriately. Additionally, one can restrain anger and frustration. When individuals can control their feelings and thoughts, their behaviour will be expressed in the right and proper way.

Cognitive Flexibility (CF) is a broad term that generally refers to our ability to easily adapt to our constantly changing environment and situations (Center on the Developing Child at Harvard University, 2011; Hendry et al., 2016; Phillips-Silver & Daza, 2018) and update our strategies when the need for change has become sufficiently salient (Howard & Melhuish, 2017). When there is more than one topic to think about, children need to use this ability to solve problems, find new ways to solve them, and evaluate the relationships between different concepts (The Understood Team, 2021). They can let go of their old ways of doing things in order to use new ones. Moreover, it should enable them to change their points of view and switch from one task to another (Chutabhakdikul et al., 2017). Additionally, children should be able to adapt time, manner, and target to fit new situations.

Various methods were used to assess executive functions for behavioral performance levels. A suitable method of assessment is to observe preschool children's behavior. Isquith et al. (2005) designed the Behavioral Rating Inventory of Executive Function – Preschool (BRIEF-P). This brief assessment method was designed to measure the behavior of children aged between 2–5 years old. The assessment was done by teachers and parents and involved asking 63 questions. Using questionnaires, the teachers and parents had to observe the child's behavior then rate the frequency using 1 = never, 2 = sometimes, and 3 = often. The questions were used to assess 5 executive function behaviors in children experiencing difficulties, namely inhibition, shifting, emotional control, working memory, and planning/organizing. Chaiakaraphong (2020) assessed a child's performance using a simulation where the situation was not real, but the child's behavior was revealed nonetheless. In this assessment, the handbook, criteria, and score were all analytic rubrics. Furthermore, in Thailand, the MU EF-101 (Mahidol University Executive Function Test) was used to assess EF development, whereas the MU EF-102 (Mahidol University Executive Function Test) was used to assess behavior problems (Chutabhakdikul et al., 2017). To assess each child's EF behavior using this method, the observers must be close to and familiar with the child.

Conceptual Framework of the Study

Based on the comprehensive literature review related to executive function behavioural of preschool children at 3–4 years old, the study's conceptual framework was created (Figure 1).

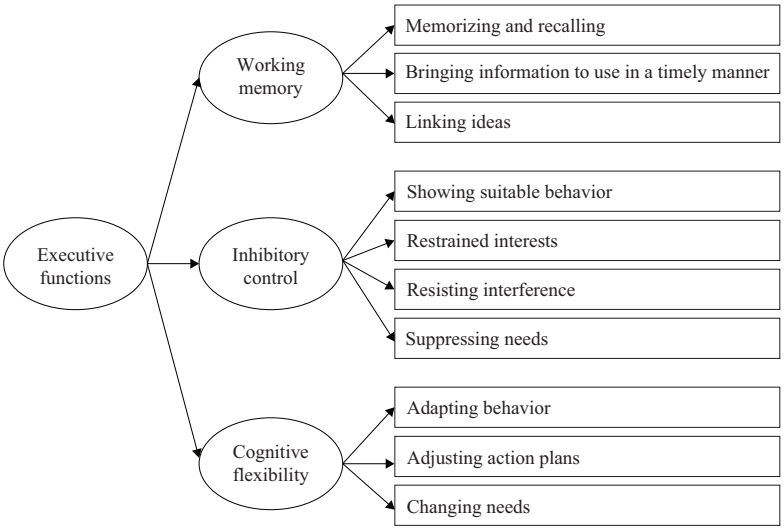

Figure 1 The components and indicators of executive functions

Methodology

This study utilized a survey method. The researchers began by studying and synthesizing components, behavioural indicators, and evaluating executive functions in preschool children aged 3–4 years old.

Participants

The research population consisted of preschool students aged 3–4 years old. The sample comprised 389 students from schools under the jurisdiction of the Office of the Basic Education Commission, local administrative organizations, and the Office of the Private Education Commission with preschool levels in 6 regions of Thailand. The sample was obtained through multi-stage random sampling, with the following steps: (1) cluster sampling from the list of provinces in each region: North: Chiang Rai, Mae Hong Son, and Lampang provinces, Central: Phra Nakhon Si Ayutthaya, Saraburi, and Lopburi provinces, East: Sa Kaeo, Rayong, and Chonburi provinces, West: Tak, Phetchaburi, and Ratchaburi provinces, Northeast: Kalasin, Sakon Nakhon, and Ubon Ratchathani provinces, and South: Phatthalung, Trang, and Nakhon Si Thammarat provinces; (2) cluster sampling from schools in 3 affiliations of each region: Schools under the Office of the Basic Education Commission: Chiang Rai, Ayutthaya, Sa Kaeo, Tak, Kalasin, and Phatthalung, Schools under local administrative organizations: Mae Hong Son, Saraburi, Rayong, Phetchaburi, Sakon Nakhon, and Trang, and Schools under the Office of the Private Education Commission: Lampang, Lopburi, Chonburi, Ratchaburi, Ubon Ratchathani, and Nakhon Si Thammarat; (3) cluster sampling from schools in each province, resulting in 18 schools; and (4) cluster sampling from Kindergarten 1 classrooms, resulting in 389 Kindergarten 1 students from one classroom per school. This sample size aligns with Soper (2023) guidelines for determining sample sizes in structural equation modeling (SEM) studies. Specifically, Soper (2023) recommends a minimum sample size of 156 as a general rule of thumb for SEM analyses.

Data Collection

Data were collected from 10 essay questions to assess preschoolers' executive functions (EFs). Modified EF indicators from the Center on the Developing Child at Harvard University (2011), Hendry et al. (2016), Howard and Melhuish (2017), Phillips-Silver and Daza (2018), Palittapongarnpim (2018), The Understood Team, (2021) and Wiebe et al. (2011) provided three components and ten indicators as synthesis. Experts evaluated linked hypotheses by compiling components and ten indicators of executive functions into questionnaires. The index of conformance (IOC: Index of Item Objective Congruence), which provides a way to verify structural validity, was used to ensure that the material was consistent or that each component was in the same direction. In addition, it ensured the consistency of each component's indicators. The researcher chose the scorecards from 3 experts which had an IOC value larger than 0.60.

The assessment of executive functions in children aged 3–4 years old was conducted using scores from analytic rubrics. Eighteen classroom teachers observed the EF behaviours of their own students and recorded the results in an EF assessment form. They used analytic rubric scoring criteria and rated behaviours on a 4-level scale: 3, 2, 1, and 0. Before using this assessment form, teachers were given detailed instructions on its proper use.

Data Analysis

Confirmatory Factor Analysis (CFA) was used to analyse the data using the LISREL Version 9.30 program. Its estimated parameters were calculated from the Maximum Likelihood (ML) to investigate the structural linearity. In addition, the congruence of the model was based on the empirical and theoretical structural equations by considering the statistical measure of the level of conformity. Chi-square, chi-square/*df*, Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI), Standard Root Mean Square Residual (SRMR), Root Mean Square Error of Approximation (RMSEA) and comparisons of the importance of the components and of the empirical data were all used to determine the factor loading.

Results

The objective was to develop Executive Function indicators of preschool children in Thailand. The results show that the Executive Functions are composed of 3 components and 10 indicators. The Executive Function assessment form was validated by 3 experts who used the Index of Objective Congruence (IOC) ranging from 0.33–1.00. The suitable behavioural indicator of inhibitory control was 0.33. In summary, there are 9 indicators. The first component is working memory. It is composed of 3 indicators: memorizing and recalling,

bringing information to use in a manner, and linking ideas. The second component is inhibitory control which has 3 indicators: restraining interests, suppressing needs, and resisting interference. The third component is cognitive flexibility. It is composed of 3 indicators, which are adjusting action plans, changing needs, and adapting behaviour.

A second-order Confirmatory Factor Analysis (CFA) of Executive Functions was also conducted and it showed that the overall fit of the model with the data was good (χ^2 = 27.95, *df* = 21, *p* = .14, χ^2 /*df* = 1.33, RMSEA = .03, GFI = .98, AGFI = .97, SRMR = .02). Cognitive flexibility had the highest factor loading (.98), followed by working memory and inhibitory control (.86). Variable factor loading ranged from .57 to .66, and the discrepancy ratio was expressed as a percentage of variables ranging from 72 to 96. The results are shown in Table 1 and Figure 2. The Confirmatory Factor Analysis of the Executive Functions of the 389 preschool children suggested that all of the indicators met the criteria. These results confirmed that the model was consistent with the empirical data.

Table 1 The validity analysis of the conceptual elements of executive functions in preschool children

Variables	Loading	Standard Error	t	R2
Working memory	0.86	0.05	17.57	0.74
WM1	0.66	0.03	22.45	0.81
WM2	0.63	0.03	22.23	0.80
WM3	0.62	0.03	21.69	0.77
Inhibitory control	0.86	0.05	16.71	0.73
IC1	0.58	0.03	20.96	0.75
IC2	0.57	0.03	20.33	0.72
IC3	0.57	0.03	21.68	0.78
Cognitive flexibility	0.98	0.05	19.24	0.96
CF1	0.62	0.03	20.32	0.74
CF2	0.57	0.03	20.03	0.73
CF3	0.58	0.03	20.09	0.72

Note: WM1 = Memorizing and recalling, WM2 = Bringing information to use in a timely manner, WM3 = Linking ideas, IC1 = Restraining interests, IC2 = Suppressing needs, IC3 = Resisting interference, CF1 = Adjusting action plans, CF2 = Changing needs, CF3 = Adapting behavior, WM = Working Memory, IC = Inhibitory Control, CF = Cognitive Flexibility

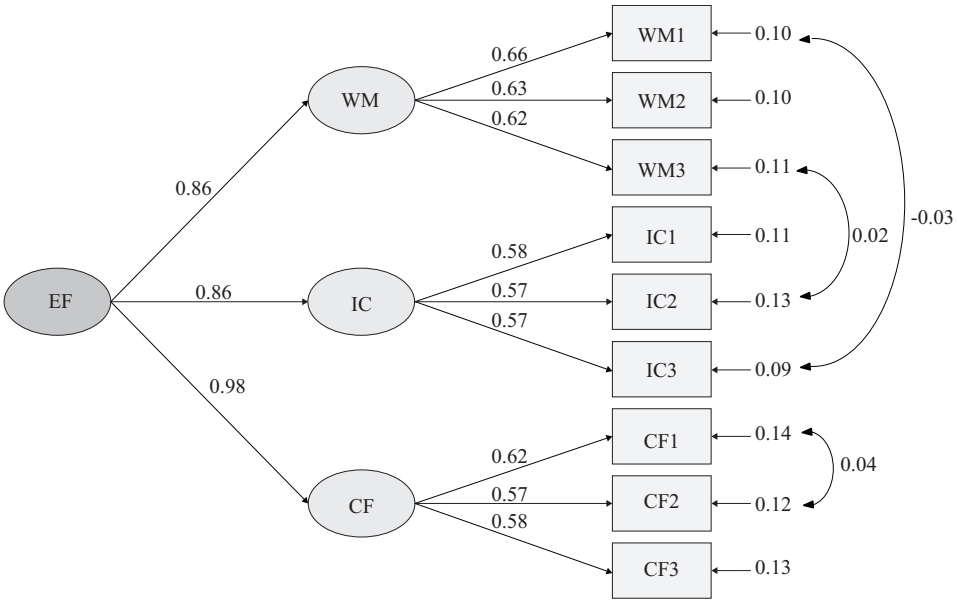

Figure 2 A second order confirmatory factor analysis of the executive functions in preschool children at 3–4 years in Thailand
Note: Chi-Square = 27.95, *df* = 21, *p* value = .14, RMSEA = 0.03

Discussion

The research aimed to develop the indicators of EFs in preschool children aged 3–4 years old. To study the basic data about the components, indicators, and the EF assessment of preschool children aged 3–4 years old, the researchers reviewed the concepts, theories, and related research. We discovered that the components and EF indicators of preschool children consisted of 3 components (Howard & Melhuish, 2017). They are working memory, inhibitory control, and cognitive flexibility. These are the main EF components and the foundation leading to a more advanced level. The mentioned components related to this research are part of a conceptual framework that includes the concepts, theories, and other studies about statistical factors. Indeed, the 3 EF components were tremendously important. The construct validity was evaluated by a second-order CFA. As a result, the highest loading factor was cognitive flexibility. The EFs in preschool children first begin to develop with their cognitive flexibility, when the children are activated and supported. Chevalier and Blaye (2008) mentioned that a lack of cognitive flexibility in some preschoolers was affected by poor activation.

The results showed that all EF indicators were significantly related to each other. The most correlated pair was "Adjusting action plans" and "Changing needs". The most essential aspect of cognitive flexibility was to adjust, adapt, and change. It is a goal-oriented behavior to accomplish tasks. When children discover other solutions, they tend to choose new ways and change their needs. When they struggle to accomplish a task, they use their working memory. The chosen memories are short-term memories as well as activated long-term memories. These memories are then used immediately by linking the ideas together, combining old and new experiences, and adapting by adjusting to the concept and environment in order to continue the activity or task. Even though interesting things or obstacles can be encountered, children are able to suppress their interests and behave appropriately.

The total average for the working memory indicators was the highest, as a 3-year-old child has the ability to memorize rules (Center on the Developing Child at Harvard University, 2011). The "remembering and recalling" indicator had the highest total average score among working memory and EF indicators, and thus was the most powerful predictor of higher-level cognition (McCabe et al., 2010).

The results of the second-order confirmatory factor analysis for all the topics revealed that the factor loading was between .86 to .98 and was statistically significant at the .05 level. When ranking the indicators that are suitable as indicators of EFs, the results showed cognitive flexibility with a loading factor of .98, and working memory and inhibitory control with loading factors of .86. The data show that the EF indicators for preschool children are cognitive flexibility, working memory, and inhibitory control.

To develop tools for EF assessments in preschool children, the scoring criteria should be set using analytical scoring rubrics. The rubric properties should be qualified using clear criteria and comparative language to differentiate quality (Wiggins, 1998). The developed assessment questionnaire's quality was high, with a coefficient alpha > 0.9 (Kanchanawasri, 2012).

Conclusion and Recommendation

The study concluded that the indicators of executive functions in preschool children aged 3–4 years old in Thailand consisted of 3 components and 9 indicators. The research findings showed that the second-order Confirmatory Factor Analysis of the Executive Function model was consistent with the empirical data. This provided clear evidence that there are 3 main components supporting executive functions. These components include working memory, inhibitory control, and cognitive flexibility. The results of this research will help teachers, educators, and those involved with preschool children to use this EF assessment tool to observe the behaviour of children under their care, providing information for behaviour modification and further behavioural support.

Conflict of interest

The authors declares that there is no conflict of interest.

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Dehumanization in Javanese metaphorical insults

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Abstract

This study employs a descriptive-analytical qualitative method to investigate the utilization of metaphorical insults in the Javanese language through the perspective of social semantics with regard to dehumanization. Metaphorical insults that compare humans with non-humans have metaphorical implications. The research aims to understand the emotional connotations of insults that associate humans with non-human entities, such as anger, hatred, or even closeness. The findings demonstrate that insults referencing animals are often employed as curses, based on the nature of the animal in question. Additionally, the study reveals that insults referencing inanimate objects are rooted in their functions, values, or negative qualities. Furthermore, the study posits that metaphorical insults referencing plants or plant parts tend to be based on the perceived value or qualities of the plant, the change of a certain plant's form, as well as disproportionate juxtaposition. These insults referencing plants can be considered as a new form of dehumanization. The study concludes that metaphorical insults constitute a soft form of symbolic violence in Javanese society, perpetuated through language as a cultural and social practice wherein one individual exerts dominance over another.

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Introduction

Dehumanization is frequently manifested in the Javanese language as a form of communicative disorder through the use of metaphorical insults, which serve as expressions of symbolic violence. Insults are emotionally charged statements consisting of harsh words or insinuations that are directed at a person and often take the form of metaphorical expressions (Hughes, 2006). These metaphorical insults associate human beings with non-human entities such as inanimate objects, plants, and animals. These statements should not be taken literally, but rather should be understood in terms of the metaphorical qualities they carry that can be classified as second-layer meanings (Kovecses, 2010). As such, metaphorical insults are considered a form of symbolic violence. When human beings are associated with non-human entities, it constitutes an act of dehumanization (Over, 2021).

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Previous research on invectives or insults has covered various trends, including linguistic, socio-cultural, psychological, and insults using the term related to climate change. Relevant studies utilizing a linguistic perspective have employed various approaches such as the semantic-pragmatic approach applied in works by Karsana et al. (2015), Fasya and Suhendar (2013), and Kristiano and Ardi (2018); the translation science approach shown in the works by Vitasari (2013), Ameri and Ghazizadeh (2014), and Anggraini and Himawati (2017); and the corpus approach as demonstrated by the work of Pamungkas et al. (2022). Related studies utilizing a socio-cultural approach have been conducted by Nicolau and Sukamto (2014), Sajarwa (2021), and Dewaele (2004), while relevant studies utilizing a psychological approach have been carried out by Anderson et al. (2010) and Stephens and Robertson (2020). Additionally, research on insults in the form of sarcasm and humor with regard to climate change and global warming has been conducted by Eslen-Ziya (2022). The results of these studies suggest that while general forms of insults have been studied, the examination of metaphorical insults, particularly from the perspective of social semantics with regard to dehumanization, has yet to be undertaken. Moreover, studies with a social semantic perspective are able to reveal the meaning and social function of cursing in society in order to provide a more comprehensive analysis (Kroeger, 2019).

This research differs from previous studies in both its material and formal objects of analysis. Specifically, it focuses on the examination of metaphorical insults and employs a social semantic perspective related to dehumanization. The study of metaphorical insults is grounded in the understanding that metaphors are a product of mental construction based on the principle of analogy, which involves conceptualizing one element in relation to another and transferring meaning from concrete to abstract concepts (Lakoff & Johnson, 2003). The study of dehumanization is based on the notion that it is a behavior or process that degrades a person, defined as the view or treatment of others as if they lack the cognitive capabilities of human beings. In other words, as articulated by Haslam and Loughnan (2014), dehumanization is "the denial of full humanness in others and the cruelty and suffering that accompanies it."

The analysis of metaphorical insults is based on the notion that language is a social phenomenon that is influenced by a variety of factors, including both linguistic and non-linguistic factors such as social and situational factors (Wijana, 2006). Language serves as a means of conveying a person's concepts, ideas, and expressions to others, and one of its forms is insults. As a form of symbolic violence, the expression of metaphorical insults not only serves as a means of releasing emotions in unpleasant situations (Allan & Burridge, 2006), but also has a pragmatic function of strengthening closeness or intimacy. Due to this, metaphorical insults fall under the category of dehumanization. This perspective led to the formulation of two research questions. First: What forms and meanings of metaphorical insults exist in the Javanese language? Second: What is the reasoning behind the use of these metaphorical insults?

Literature Review

Dehumanization

Dehumanization, as described by Over (2021), is closely linked to the concept of human essence. This encompasses actions that demean or devalue individuals, categorizing them as subhuman. Smith (2011) also supports this viewpoint, noting that dehumanizing treatment includes actions that fail to acknowledge the inherent value of human beings. Research by Harris and Fiske (2006, 2011) suggests that dehumanization is closely tied to an individual's mental state and can result in the perception of certain groups, such as the homeless and drug addicts, as "incomplete humans." However, Haslam and Loughnan (2014) argue that dehumanization can also be linked to distinct human attributes that set humans apart from other species, such as morality, rationality, and maturity. Additionally, dehumanization can also be perpetuated through the exercise of power, as demonstrated by Gwinn et al. (2013) who found that rulers can significantly influence interpersonal perceptions. Overall, dehumanization is primarily studied within the field of psychology rather than social science.

Dehumanization is a complex phenomenon that experts have categorized into four distinct types: associating humans with non-humans, perceiving humans inappropriately, regression of values, and abuse of power. The first type, associating humans with non-humans, includes actions that liken individuals to animals or inanimate objects. This can be seen in the historical treatment of African Americans as subhuman, likened to apes (Over, 2021), or in the portrayal of people as pests, such as during the Holocaust or in the massacre of the Tutsis in Rwanda (Harris & Fiske, 2011). The second type, perceiving humans inappropriately,

involves the dehumanization of certain groups through harmful stereotypes and prejudices. This can be seen in the treatment of illegal immigrants as criminals or terrorists (Haslam & Stratemeyer, 2016). The third type, regression of values, can be observed in the field of education. Freire (2007) argues that dehumanized education is characterized by a lack of freedom and critical thinking, turning students into robotic and uncritical individuals, as opposed to Humanistic education that empowers students to think and act freely. The fourth type, abuse of power, can be observed in instances where those in power use their authority to dehumanize marginalized groups (Gwinn et al., 2013). Overall, these four types of dehumanization demonstrate the multifaceted nature of this phenomenon, which can manifest in various forms and across different contexts.

Insults

The use of insults or invectives can be understood as a form of emotional release or expression of dissatisfaction with a particular situation. Insults serve not only as a means of expressing hatred or as a release from negative experiences (Hughes, 2006), but it is also a linguistic phenomenon that exists within society. Resorting to insults is a behavior that is exhibited by individuals across various social groups and classes, including both the lower and upper middle class. This is closely related to the field of sociolinguistics, which views language as a social behavior employed in communication (Mayasari & Muzaki, 2019). The use of insults can also be examined through the lens of gender (Nicolau & Sukamto, 2014) and social class (Sajarwa, 2021). Furthermore, psychological research on insults has revealed that it can serve as an emotion generator, leading to physical responses such as an increased heart rate and pain (Stephens & Robertson, 2020). This highlights the complexity of cursing and its impact on the individual and society.

There are three key characteristics that are used to determine whether an utterance constitutes an insult. Firstly, the use of language that is considered taboo within a society. Secondly, the utterance is not meant to be taken literally but instead carries a metaphorical meaning. Thirdly, the utterance is used as a means of expressing a strong emotion (Anderson et al., 2010). Cursing also serves pragmatic functions such as giving compliments, expressing wonder, and building closeness or intimacy. Insults can be understood as a means of expressing emotions that serve both personal and social functions (Heriyanto, 2020). Moreover, using the SWAD (Swear Words Abusiveness Dataset) corpus data can predict the level of violence in a given utterance (Pamungkas et al., 2022).

Metaphor

Metaphor is a linguistic style that involves the transfer of meaning from one concept to another, also known as conceptual metaphor. According to Lakoff and Johnson (2003), conceptual metaphor is a product of mental construction based on the principle of analogy, which involves understanding one concept in terms of another. The concept that is often metaphorized is the concept of emotion. Emotion is an abstract concept, which is analogized into another more concrete concept (Lakoff & Johnson, 2003). This perspective is supported by Kövecses (2006) and Lyra et al. (2016) who posit that metaphor comprises of a source domain and a target domain, where the target domain is more abstract than the source domain. Evans and Green (2006) also emphasize that the source domain and target domain cannot be interchangeable as the relationship between them is unidirectional. Additionally, Kövecses (2006) links metaphors to culture, noting that culture plays a significant role in shaping metaphors. Yu (2010) further argues that lexical choices in metaphor are influenced by human socio-cultural experiences. Thus, metaphors are not simply linguistic expressions, but also a reflection of the socio-cultural beliefs and practices that surround them.

Lakoff and Johnson (2003) have classified metaphors into three distinct categories: structural metaphors, orientational metaphors, and ontological metaphors. Structural metaphors involve the transfer of meaning from one concept to another based on systematic correlations between daily life experiences. Orientational metaphors, on the other hand, pertain to the orientation of human experience and its relationship with cultural influences (Kovecses, 2010). These metaphors are based on spatial orientation, which emerges from physical experiences in organizing directions in life and are integrated in the human mind to concretize abstract concepts (Gibbs, 2006). Finally, ontological metaphors involve conceptualizing abstract thoughts, experiences, processes, and other abstract things as having physical properties. In other words, ontological metaphors make abstract nouns into concrete nouns as stated by Nirmala (2014) and Musolff (2006). This highlights the different ways in which concepts can be transferred through metaphor and how these different types of metaphors are based on different aspects of human experience and culture.

Verbal Violence

Verbal violence, also known as verbal abuse, is a form of behavior in which an abuser uses words or manipulative tactics to exert dominance and control over the victim, instilling doubt and insecurity (Bosch, 2007). This form of violence is often difficult to detect as it can be perpetrated unconsciously and is often a precursor to physical violence. Verbal violence is typically characterized by communication patterns that include insults or harassing language (Rasyid, 2013). In the field of feminist psychology, verbal violence is considered a form of psychological violence (Gamble, 2010). The purpose of verbal violence is to threaten, demean, order, hurt, mock, hide the truth, criticize, and show indifference. And although language can be used to insult, insults or verbal violence are against the principles of good and polite communication.

The use of language in verbal violence can be classified into several categories. One category is the use of swear words associated with animals, such as "dog" and "swine," or the specifically Indonesian insult words "*cebong*" (literally "tadpole") and "*kampret*" (literally "microbat," although it can also be translated as "shucks"). Another category is the use of swear words and insults that have negative connotations, such as "bastard" and "idiot," as well as words with sexual elements. Additionally, insults also serve to create a more harmonious relationship between familiar participants. For example, in the Javanese cultural context, cursing can be used to show familiarity. They are usually used to address people who already have a close relationship with others (Angelica & Purnomo, 2024). In contrast, there are derogatory terms used in place of pleasant or neutral ones to emphasize the negative meaning of what is being said, as explored by Yun (2010) and Putra (2015). Ek et al. (2013) also added that verbal violence can be categorized into three types: yelling, cursing, and giving negative nicknames or labels.

Methodology

The current study conducts an analysis of the utilization of metaphorical insults in the Javanese language, which possess both literal and metaphorical qualities. Both literal and metaphorical insults are used to express annoyance or similar feelings as a reaction to something the speaker sees, feels, or hears. As previously demonstrated by Wijana (2006), metaphorical insults in the Javanese culture may associate individuals with objects, animals, supernatural entities, and professions. The choice to use these metaphorical insults is based on their prevalence in both written and spoken forms within Javanese society. The utilization of these metaphorical insults is not limited to a specific age group and is commonly employed by both adults and teenagers as a means of expressing a wide range of emotions, including anger, annoyance, disappointment, regret, humiliation, and surprise, both personally and socially.

To gain a comprehensive understanding of the usage of metaphorical insults in the Javanese language, this study employs a qualitative method, specifically an analytically descriptive approach (Neumen, 2003). According to Creswell and Guetterman (2011), a qualitative research method is research that explores information from objects/participants at large by asking questions that are general in nature, and data collection is realized through the description of the text subjectively (Creswell & Guetterman, 2011). In this study, the qualitative method is used to identify the meaning of insults as well as its dehumanizing form to determine its category. The descriptive aspect of this method is utilized to identify the various forms of metaphorical insults used within Javanese society, following the approach outlined by Nassaji (2015) of describing a phenomenon and its characteristics. The analytical aspect, which is based on the descriptive data collected, is employed to uncover the meaning behind these metaphorical insults and to explain the reasons for their usage. This combination of descriptive and analytical approaches, as outlined by Spradley (2007), is directed towards describing the cultural characteristics present in individuals or groups within a cultural community.

The present research utilizes two types of data, namely, written and oral data, to investigate the usage of Javanese metaphorical insults. The written data, in the form of Javanese story manuscripts, range from those published in the 1930s to the present day. These manuscripts, which consist of short stories called *cerita cekak* (*cerkak*), were obtained from a local newspaper named *Kedaulatan Rakyat* and the online version (2022; 2018; 2022). The use of short stories published in 1930 and later years as the written data aims to ensure that the insults are used from the past until present. It also serves to encompass the diversity of writing in both old and contemporary forms of the Javanese language. The oral data, obtained through observations and interviews, were employed to ensure and see the continued usage of Javanese metaphorical insults in contemporary daily life. The interviews were conducted with both male and female informants who represent two main Javanese

dialects: the Jogja Javanese and the Solo Javanese dialects (Appendix). The interview is conducted by two methods. The first method is a direct interview, that is an interview conducted by meeting the interviewees when they are doing their social activities that involve many people (community service, celebrations, etc.). The second method is an interview by listening and recording the use of insults without a formal interview and only by listening to interactions in the community. These dialects are considered to be the standard Javanese language spoken in the Surakarta (Solo) and Yogyakarta areas, respectively (Sumarsono, 2014).

The data for this article were collected through a multi-method approach, including written material mapping, observation, and informant interviews. The written material mapping involved recording and documenting the usage of metaphorical insults, identifying the forms of these insults, and categorizing them based on the types of metaphorical referents. The identification of metaphorical cursing referents is important to reveal what types of referents are used by Javanese people (Sudarmaningtyas, 2020). Each data point was subsequently assigned a numerical code according to its metaphorical category. The observation component of the study involved participating in public activities where metaphorical insults are commonly used, such as *gotong-royong* (communal labor activities), traditional ceremonies, and community meetings. In addition, a sample of male and female informants from various professional backgrounds and age groups were interviewed to confirm the existence and ongoing use of metaphorical insults as recorded in the previous observations.

The data collected from observations and interviews were analyzed through a three-stage process. The first stage of analysis involved classifying the data based on their metaphorical references, namely, animals, objects, and plants. This first stage aims to find out the references that appear in insults. The second stage of analysis will uncover the meaning of these metaphorical insults. This stage aims to reveal the meaning and socio-cultural function of the use of insults in society. This discussion is presented in the discussion section. The third stage of analysis examined the underlying motives and reasoning behind the usage of the metaphorical insults in their various forms and contexts. The last stage aims to explain that insults are used to express annoyance and displeasure. Insults are also used to show the intimacy of the relationship, which Bourdieu describes as symbolic violence and wisdom. In addition, this analysis also aims to understand the peculiarities of metaphorical insults in Javanese. The results of this analysis provide insights into the questions posed in the present study.

Results

Metaphorical insults are a means of expressing emotions such as anger or hatred towards others through the use of comparisons to non-human entities such as animals, objects, or plants. The following data comprise three metaphorical insult referent categories that have been identified in this study, namely, animal (animate), objects (inanimate), and plant (animate) referents. The separation between animate and inanimate is because they both have different functions of insults. The animate one is taken based on its nature, while the inanimate one is taken based on its function. The classification of metaphorical insults into the following three tables was derived from written and oral data. This classification aims to discover the references and functions of metaphorical insults in society.

Metaphorical insults, which are characterized by the use of animal names as references, can be found in various language compositions. Table 1 illustrates the prevalence of this phenomenon, specifically in regard to the use of animal names to denote certain traits of the second person. These traits include: the tendency to abandon responsibilities as seen in data (1), irresponsibility in data (6), and stealing in data (7). Additionally, Table 1 also demonstrates that the use of animal names as second-person comparators is influenced by the context in which the language is being used. For example, in the context of family relationships (father and child) as seen in data (4) and (6), traveling context in data (5), friendship context in data (1), (2), (3), (9), (10), (11), and (12), as well as the context of hatred as seen in data (7) and (8).

Table 1 also demonstrates that the utilization of animal names in metaphorical insults is not solely used to express anger. On the contrary, the use of animal names can also serve to establish an atmosphere of intimacy or closeness. This can be observed in data (3) and (10) where intimacy is implied in the context of casual conversation, in data (4) for the context of working together, in data (9) for the context of dining together, and in data (12) for the context of friendship. Therefore, it can be inferred that the use of animal references in metaphorical insults should not be solely viewed as a form of symbolic violence, but also as a cultural mechanism for creating or reinforcing social bonds.

Table 1 Javanese Metaphorical Insults with Animals as Referents

No.	Referent	Example	Source
1	*Asu* (dog)	*"**Asu** tĕnan kowe! Takparani bola-bali ora tau ana."* ("You're such a **dog**! I came by so many times, but you were never there.")	Informant 6
2	*Munyuk* (monkey)	*"Ooo **munyuk**! Diĕntèni malah ninggal."* ("You **monkey**! I waited [for you] but you left instead.")	Informant 1
3	*Wĕdhus* (goat)	*"**Wĕdhus**! Lunga ora omong."* ("**Goat**! [You] left without a word.")	Informant 4
4	*Kirik* (puppy)	*"**Kirik**! Kon njupuk wédang, malah dolan."* ("**Puppy**! [I] told you to get a drink but you [went to] play around instead.")	Informant 8
5	*Bangsat* (chinch)	*"Pancen **bangsat**, mènggok ora réting."* ("Such a **chinch**! Turning without making a sign.")	Informant 3
6	*Bĕdhès* (infant/baby monkey)	*"**Bĕdhès**! Durung rampung umbah-umbah, minggat."* ("**Infant**! The laundry isn't yet done but he's left.")	Informant 8
7	*Cèlèng* (boar)	*"**Cèlèng**! Cah kuwi jĕbulé nyolongan ta?!"* ("**Boar**! Turns out that kid likes to steal, huh?!")	Informant 2
8	*Baya* (crocodile)	*"Pancen **baya**, sĕnĕngané golèk prĕkara."* ("Such a **crocodile**, always looking for trouble.")	Short story 2
9	*Kethèk* (ape)	*"Wah kowé **kĕthèk** tĕnan! Sakmana okèhé dipangan dhéwé."* ("Wow you're such an **ape**! That much [food] and you ate it all by yourself.")	Informant 5
10	*Kamprèt* (microbat)	*"Aku ki ra mudhĕng, ngĕrti kata kuwi saka kowé, **kamprèt**."* ("I had no idea. I learnt that word from you, **microbat**.")	Short story 4
11	*Gĕnjik* (shoat/baby boar)	*"Oo **gĕnjik**! Isa-isane kowé ngarani aku pelit."* ("Such a **shoat**! How dare you think of me as stingy.")	Informant 2
12	*Jangkrik* (cricket)	*"**Jangkrik**! Yèn lagi mangan lali kancané."* ("**Cricket**! When [you] eat [you] forget about [your] friends.")	Informant 1

Javanese metaphorical insults may utilize inanimate objects as referents in addition to animals. The second person is equated with these objects, which can range from household appliances, professions, food, body parts, supernatural entities, excrement, and musical instruments. As shown in Table 2, the association of objects with the second person is often based on their function; for example, data (15) references the function of a trumpet, data (16) references the function of the face, data (17) references the function of the ear, and data (20) references the function of the brain. In data (20), the emphasized word is "utek", not "encer". It shows that someone can insult others with words related to body parts references (Wijana, 2012). Therefore, in this context, instead of saying "smart", one says "utek e". In data (19), the word "gondhes" means actually *gondrong ndeso* 'village man with long hair'. A person who insults using this word will emphasize that the long hair for man has improper meaning. Additionally, the association of the second person with objects that do not have a function is also evident, as demonstrated in data (18) which references cloth that does not function. Data (20) and (21) also shows that brain and eyes, as body parts referents, do not have function to think and see. However, even though the insults take reference from body parts, they are still categorized as inanimate (Wijana, 2012).

Table 2 also illustrates the use of supernatural entities as referents in Javanese metaphorical insults, specifically entities that are deemed to be scary. For example, data (22) references a supernatural entity that is considered scary in its form, and data (23) references one whose sound of voice is considered scary. Additionally, there are also associations with objects in the form of food or drinks, as demonstrated in data (24) which references drinks that are popular among lower classes or are of low price, and data (25) which references a cheap food made from soybean pulp. Furthermore, there is also an association a with dirty, unappealing object, as seen in data (14). Additionally, Table 2 also illustrates the association of the second person with professions that are considered low, such as in data (13) which references the profession of bullock cart drivers, and in data (19) which references a thief. Overall, the use of objects as referents in Javanese metaphorical insults is based on the qualities of the objects, namely, their undesirable, cheap, scary, unappealing, or dysfunctional nature.

Table 2 Javanese Metaphorical Insults with (Inanimate) Objects as Referents

No.	Referent	Example	Source
13	*Bajingan* (bullock cart driver)	*"Kamangka wis takbantu nggo mbayar utang, lha kok pitku digadhèkaké. Dhasar **bajingan**!"* "I actually helped pay [his] debt, but [he] dared pawn my motorcycle. What a **bullock cart driver**!")	Informant 4
14	*tělèk* (animal excrement)	*"**Tělèk**! jaré mung tělung dina, nganti sěminggu durung disaur."* ("**Shit**! He said three days, but it's been a week [and he] hasn't paid back.")	Informant 6
15	*Slomprèt* (trumpet)	*"Dicěluk, ěthok-ěthoke ora krungu. **Slomprèt**!"* ("I called out [but he] pretended not to hear. **Trumpet**!")	Informant 9
16	*Rai gědhèg* (literally "bamboo mat face"; shameless)	*"Dhasar **rai gědhèg**, wis konangan, isih ngguya-ngguyu."* ("Such a **bamboo mat face**, caught red-handed [and yet he] kept giggling.)	Short story
17	*Kuping manci* (literally "ear of pan," or pot handle; hard of hearing)	*"**Kuping manci**! Wis diběngoki malah těrus ora mandhěg."* ("**Pot ear**! Got shouted at, yet he kept going and wouldn't stop.")	Informant 3
18	*Gombal* (literally "used cloth"; sweet talk, hooey)	*"Kowé ki **gombal**. Janji těka jam 5 nganti jam 7."* ("You're a **used cloth**. [You] promised to come at 5 [but did not come] until 7 o'clock.")	Informant 9
19	*Gondhès (thief)*	*"Janji mangkat jam 3, jam 5 lagi tangi. **Gondhès**!"* "You promised to leave at 3, but only woke up at 5 o'clock. **Thief**!"	Informant 2
20	*Utěk èncèr* (literally "diluted brain"; thinking clearly)	*"Nèk ésok adus grujuk, **utěke** bèn **èncèr**."* ("In the morning, take a big shower so your **brain gets diluted**.")	Informant 5
21	*Mata picěk* (blind eye)	*"**Matané picěk**, Ana wong lungguh ditabrak."* ("**Blind [eye]**, he hit someone who was merely sitting around."	Short story 1
22	*Mak Lampir* (the name of a famous fictitious witch)	*Ngguyuné kaya **Mak Lampir**.* (Her laughter is like **Mak Lampir**'s.)	Short story 4
23	*Iblis* (demon)	*"O **iblis**, sěněnganě těbar pěsona."* ("Such a **demon** [who] loves to spread [his] charm.")	Short story 2
24	*Bajigur* (a kind of warm drink)	*"**Bajigur**! Krupuk sakplastik diěntèkné."* ("**Bajigur**! He finished a whole plastic bag full of crackers.")	Informant 4
25	*Gěmbus* (tempeh made from soybean pulp)	*"**Gěmbus**! Omongmu ora isa dipěrcaya."* ("**Gembus**! Your words can't be trusted."	Proverb

In the Javanese language, metaphorical insults often employ plants or plant-related imagery as a means of referencing the person being addressed. This utilization of plant-based imagery is based on various factors, including the perceived value, taste, or odor of the plant in question, as well as its physical characteristics, such as shape and form. As demonstrated in Table 3, this can manifest in a variety of ways, such as the association of the second person with a type of fruit with an unpleasant taste, namely, in data (27) which refers to a fruit with a sour taste, and in data (29) which refers to a plant with a bitter taste. There are also associations with types of plants that are cheap or low in value, namely, in data (26) which refers to plants that are cheap or are usually consumed by the lower classes, as well as in data (28) which refers to low-quality tobacco. There is also an association with a type of fragrant-smelling leaf, but it is associated with a trait that is considered weak, as shown in data (30) which refers to the pleasant-smelling basil. In addition, there is also the association with a plant that experiences a change in form, namely, in data (31) which refers to the change of soybeans into tempeh. There is also an association with a type of fruit with an emphasis on shape and texture, namely, in data (32) which refers to the small and easily broken cucumber juxtaposed with the larger, hard, and thorny durian.

The data presented in Tables 1–3 include certain terminology that is specific to old Javanese, and upon confirmation with informants, it was revealed that some of them were not familiar with these terms. Furthermore, it should be noted that the metaphorical insults discussed above are not universally employed by all individuals of different social classes, genders, or age groups. Additionally, it is apparent that some speakers utilize similar sounding words as a means of softening the impact of the insults, such as the substitution of "*asu*" (dog) with "*asem*" (a sour fruit such as tamarind) and "*bajingan*" (bullock cart driver) with "*bajigur*" (a type of warm drink). This phenomenon is primarily observed among the younger generation.

Table 3 Javanese Metaphorical Insults with Plants as Referents

No.	Referent	Example	Source
26	*Tela* (cassava)	*"O **tela**! Takon malah disĕnèni."* ("Such **cassava**! [I was merely] asking but got scolded.")	Informant 9
27	*Asĕm* (any sour fruit)	*"**Asĕm** ki! Sésuk nèk aku mrono takpamèri gĕnti."* ("***Asem***! When I go there it'll be my turn to show off."	Informant 8
28	*Sĕmprul* (low quality tobacco)	*"Isa-isane wingi bar bayaran, saiki ngomong ora duwé dhuwit. **Sĕmprul**!"* ("How is it possible that yesterday he made payment, and today he said he had no money. ***Sĕmprul***!")	Informant 1
29	*Gambir* Blitar (gambier/uncaria from Blitar, East Java)	*"Lha ngajak tuku bakso, aku sing kon mbayari. **Gambir Blitar**!"* ("Huh, you brought me to go buy meatball soup, then I get asked to pay. **Blitar gambier**!"	Proverb
30	*(Lanang) kemangi* ("*kemangi*" literally means "basil"; "*lanang kemangi*" refers to a cowardly man)	*"Lanang kemangi! Kon mangkat dhéwé ora wani."* "**Basil man**! Told to go alone but not guts to do so.	Proverb
31	*Esuk dhele sore tempe* (literally "soybean in the morning, tempeh in the afternoon"; used to refer to a person who cannot make up their mind)	*"Munafik tĕnan! **Esuk dhĕlé soré témpé**."* ("Such a hypocrite! **Soybean in the morning, tempeh in the afternoon**.")	Informant 7
32	*Timun mungsuh duren* (literally "cucumber versus durian"; a lowly person who challenges someone powerful)	*"Pardi kok mungsuh Pak Lurah, kaya timun mungsuh duren."* ("Pardi taking on *Pak Lurah* (the village chief) is like a cucumber taking on a durian.")	Short story 3

Discussion

The following discussion explains the meaning and socio-cultural function and motives and reasoning behind the usage of the metaphorical insults. This analysis is in accordance with the sequence of analysis presented in the method (analysis of stage 2 and 3). The tables presented above demonstrate that metaphorical insults are not only employed as a means of expressing curses or venting emotions, but also as a means of displaying the closeness of interlocutors (Tsaqilla & Yusra, 2022) and have specific contexts (Anderson et al., 2010). As illustrated in the first table, metaphorical slurs that utilize animals as referents tend to base the insult on the inherent nature of the animal. Metaphorical insults that utilize objects as referents are employed based on the functions, values, and the intimidating qualities of the objects. On the other hand, metaphorical slurs that refer to plants or plant parts tend to be used based on the plants' values, tastes, changes in form, and their disproportionate juxtaposition. As metaphorical insults are spontaneous expressions, the qualities, functions, values, and intimidating nature of the referents of the insults are not always aligned with the meaning of the accompanying sentences. For instance, in data (1), the metaphorical insult "*asu*" (dog), which has connotations of dirtiness or uncleanliness, is not followed by an event or statement that implies dirtiness or uncleanliness.

As previously stated in the second table, the use of metaphorical insults that reference animals tend to draw upon the inherent characteristics and associations of said animals. This form of insult can be considered a form of dehumanization as it goes against the fundamental nature of humanity (Over, 2021). In the context of Javanese culture, animals such as the dog in data (1) and puppy in data (4), referred to as "*asu*" and "*kirik*," respectively, are commonly used as insults due to their negative connotations and associations, particularly in a Muslim society where dogs are often viewed as unclean. Additionally, animals such as the monkey, infant/baby monkey, and ape, referred to as "*munyuk*," "*bedhes*," and "*kethek*" respectively in data (2), (6), and (9) are associated with greed, while the goat, referred to as "*wedhus*" in data (3), is associated with a silent disposition. Furthermore, animals such as the boar and shoat, referred to as "*celeng*" and "*genjik*" respectively in data (7) and (11), are considered dirty and disgusting, while the crocodile, referred to as "*boyo*" in data (8), is associated with chaos due to its shocking nature when attacking its prey or opponent. Finally, the microbat, referred to as "*kampret*" in data (10), is associated with being quiet.

In the next category shown in table three, the Javanese metaphorical insults use objects as referents based on their functions. For example, in data (15) the term "*slompret*" (trumpet) is used as an insult for its irregular and disturbing sound. In data (16) the term "*gedheg*" (bamboo mat) in "*rai gedheg*" (bamboo mat face)

refers to a person with a lack of shame, while "*kuping manci*" (pot ear) in data (17) refers to individuals with poor hearing abilities. Furthermore, in data (18) "*gombal*" (used cloth) is used to refer to something that holds no value, and in data (21) "*matane picek*" (blind eyes) refers to individuals with poor vision, and thus used as insult toward those who cause accidents. Additionally, metaphorical insults that use objects as referents based on their values, such as the professions "*bajingan*" (bullock cart driver) in data (13) and "*gondhes*" (thief) in data (19), refer to qualities that are associated with actions that violate norms. These metaphorical insults utilize these qualities to highlight individuals whose actions are not in alignment with societal values (Haslam & Stratemeyer, 2016). Furthermore, in data (14) "*telek*" (animal excrement) is used to refer to things that are considered worthless. Additionally, in data (22) and (23), respectively, "Mak Lampir" and "*iblis*" (demon) are supernatural entities that are associated with tempting and frightening human attitudes or actions. Lastly, "*bajigur*" (a kind of warm drink) and "*gembus*" (tempeh made from soybean pulp) are used as insults due to their association with cheapness.

Plants or parts of plants may be utilized as referents in Javanese metaphorical insults based on their values. For example, in data (26) and (28) the terms "*telo*" (cassava), considered a lowly plant or food, and "*semprul*" (low-quality tobacco) are used to refer to actions or attitudes that are considered negative or not in line with societal norms. Additionally, in data (25) "(*lanang*) *kemangi*" is used to refer to timid men, thus the use of this plant serves as a form of dehumanization that targets an individual's mental state (Harris & Fiske, 2011). These insults can be understood as a form of cultural construction, as suggested by (Kovecses, 2010).

Furthermore, metaphorical slurs may also use plants or parts of plants as referents based on their taste, such as in data (27) with "*asem*" (any sour fruit) and in data (29) with the bitter-tasting "*gambir* Blitar," both used to refer to unpleasant attitudes or actions. It is also worth noting that the terms "*asem*" and "*bajigur*" are considered softer forms of the swear words "*asu"* (dog) and "*bajingan*" (bullock cart driver), respectively (Saptomo & Wahyono, 2001). Additionally, in data (31) "*esok dhele sore tempe*" (soybean in the morning, tempeh in the afternoon) is used to refer to an individual who is indecisive. Finally, data (32) "*timun mungsuh duren*" (cucumber versus durian) is a form of insult that highlights the juxtaposition of unbalanced qualities.

Humans can be associated with plants or parts of plants in two ways — positively and negatively. Positively, when naming a child, for example, "*jati*" (teak), with the expectation that the child will have the strength and fortitude of a teak tree. On the other hand, negatively, when using plants as metaphorical insults, where people are compared to plants in terms of values, tastes, or forms that are associated with undesirable qualities. This is a unique form of dehumanization that uses plants as metaphors. This discovery is different from previous studies on dehumanization, such as (Over, 2021) who associates humans with animals, (Harris & Fiske, 2011) who associate humans with pests, (Haslam & Stratemeyer, 2016) who propose dehumanization as a form of inhumane treatment, and (Gwinn et al., 2013) who suggest dehumanization as a form of mistreatment of helpless people. Additionally, dehumanization studies are mostly studied from a psychological viewpoint. However, by studying dehumanization from a social science perspective, we can not only reveal metaphorical insults as a form of symbolic violence but also how members of an ethnic community construct their social relations. This is a form of cultural continuity (Santoso et al., 2024).

Metaphorical insults can be understood as a form of symbolic violence as they involve associating individuals with animals, objects, or plants. Symbolic violence, as defined by (Bourdieu, 2010) and (Dwijatmiko, 2010), is a form of invisible or soft violence that is repeated in everyday life. Heitmeyer and Hagan (2005) argue that symbolic violence is a form of cultural expression through language, specifically in the content of language. In this context, language should not only be viewed as a means of communication but also as a cultural symbol, where certain individuals hold power over others (Bourdieu, 2010).

The act of dehumanization involves reducing the value and humanity of an individual to the level of non-human entities, which can lead to negative consequences such as discrimination, prejudice, and violence. To mitigate the effects of dehumanization, it is important to promote self-awareness and humanization. As Kuntowijoyo (2013) suggests, humanization is the process of humanizing humans, which involves eliminating materialism, dependence, violence, and hatred. This can be achieved by fostering brotherhood and viewing humans in a holistic manner, eliminating hatred, and eliminating forms of violence. Moreover, due to the fact that Javanese people, both adults and children, continue to produce metaphorical insults, the understanding of human essence needs to be incorporated into education (Freire, 2007).

Knowledge of human essence can help to shape the goals of education at primary, secondary, and tertiary levels, fostering a deeper understanding and respect for human dignity and value. This can lead to a more inclusive, empathetic and harmonious society. Insults cannot be eliminated from a language and society. However, it can be reduced. When a person obtains more education, it will reduce dehumanizing behavior so that relationships between individuals in Javanese culture do not need to be or go through dehumanization. On the one hand, insults show familiarity, however on the other hand, such show discomfort. Furthermore, the existence of cursing also shows a subordinate relationship between the person who insults and the one who is insulted, and in this condition, the person who insults will feel superior.

Conclusion and Recommendation

The primary discovery of this study is the utilization of metaphorical insults in Javanese culture that utilize plants or plant parts as referents. The characterization of individuals as plants based on their perceived value, taste, or shape represents a novel form of dehumanization that employs plants as metaphorical imagery. Overall, these metaphorical insults also serve as a subtle form of symbolic violence within Javanese society. As a language practice and cultural symbol, these insults allow for the domination of one individual over another. This practice has become ingrained in certain individuals through their life experiences, resulting in the utilization of these insults not only as a means of expressing annoyance or emotion, but also as a means of displaying social closeness or intimacy.

The utilization of metaphorical insults in Javanese culture serves not only as a means of releasing annoyance, but also as a means of constructing and maintaining social relationships. In Javanese society, the maintenance of social relationships, particularly among individuals of equal social class, is achieved through a variety of means, both verbal and non-verbal. Such non-verbal forms include traditional ceremonies, sonjo or home visits, and gotong royong (communal labor activities), while verbal forms include the use of insults, which is often expressed as a form of intimacy. As such, metaphorical cursing can be viewed as a form of social capital that functions as a bonding agent within Javanese society.

The findings presented above are based on a limited dataset, comprising literature, observations, and oral interviews with a small number of informants. Expanding the data to include metaphorical insults used on social media platforms such as Twitter, Instagram, and Facebook would likely result in a more extensive, varied, and comprehensive understanding of the phenomenon. This presents opportunities for further research to examine and analyze Javanese metaphorical insults within the context of social media usage.

Conflict of Interest

The author(s) declare(s) that there is no conflict of interest.

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Appendix Informant List

No	Name	Age	Male (M)/Female (F)	Profession	Domicile
1	Seno Suparjo	53	M	Teacher	Sleman (Yogyakarta)
2	Arwan Raharjo	47	M	Farmer	Sleman (Yogyakarta)
3	Febri Irianto	35	M	Private Employee	Bantul (Yogyakarta)
4	Yayuk Eko	32	F	Housewife	Bantul (Yogyakarta)
5	Slamet	65	M	Farmer	Klaten (Solo)
6	Nanang Suprayogi	41	M	Government Employee	Klaten (Solo)
7	Agus Santosa	34	M	Teacher	Klaten (Solo)
8	Samiyem	56	F	Housewife	Klaten (Solo)
9	Victor Adi Pradana	17	M	Student	Klaten (Solo)

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Erau Festival, a tourism product from East Kalimantan as a commercial profit

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Abstract

Cultural events embedded in art create a cultural art product in the form of a festival, thereby giving the festival a purpose in its organization. The purpose of cultural festivals is to boost tourism and showcase superior local products rooted in local wisdom. The present research investigates the development of Erau as a profitable tourism product for local communities and the government. The research employs qualitative methods, involving direct observations and interviews with informants from diverse backgrounds, including government officials, using both structured and unstructured questions. Data collection is carried out in stages following the process during participation in the traditional Erau and Erau Festival. Data analysis involves describing, understanding, interpreting, and clarifying the data in detail, as well as verifying such with triangulation techniques. The results show that the material profit from the Erau Festival holds significant value for long-term economic resilience, impacting the regional economy and being overseen by local governments. The tendency of the government with capital to act as a financier has the power to shape the development of Erau into a high-value tourism product. Erau's distinction of evolving into an Erau festival as a tourism product can attract investors or major players who have significant capital to enter and develop a tourism enterprise.

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Introduction

Erau Festival is a festival of pride for the Kutai Kartanegara community, especially the district of Tenggarong City. In the past, Erau was included in the ranks of ritual ceremonies but was not sacred. Previously, Erau was referred to as the Erau Ceremony. However, with time, Erau turned into a festival. This is due to government interference and the Kutai Kartanegara Kingdom as the Erau Ceremony organizer. The meaning of Erau is bustling, boisterous, partying, fun, and joyous. Erau itself is nothing but a big celebration for the people, from the people, and by the people, supported by Kutai Kartanegara Kingdom (Bachroel, 2009).

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The people of Kutai Kartanegara believe that this celebration could only be carried out by the government. They think that the government has a large amount of capital and power compared to the Keraton itself. The palace experienced setbacks in terms of the economy due to the sultan's power being reduced in the Soekarno era through a mutually agreed-upon agreement (Imbran, 1989). At that time, the government took over the palace as part of the Indonesian government's authority, so all celebrations related to culture and tourism would be fully under the authority of the Republik Indonesia government. The Erau Festival is held for seven full days. The time for the celebration is unlimited; in this case, the Erau Festival is held from sunrise to sunset, which is midnight at around 00.00 local time. Erau Festival Celebration involves audiences or communities throughout East Borneo. People from sub-districts, regencies, and cities participate in this celebration. Public invasions from various angles did not only come as spectators or connoisseurs of the Erau Celebration. Instead, they were directly involved as participants in the Erau Festival. This participation is a matter of pride and prestige, which are felt differently by each individual. This pride is caused by having a spirit of participation in every community. Every corner of Tenggarong city has tents set up to sell or show off agricultural products and handicrafts made by the local community, such as beaded bracelets, woven fabrics, ulap doyo, and others. The selling and buying event is called an expo by the people who come from remote areas and cities in the province of East Kalimantan. During the Erau celebration, events are held every day, such as beluluh, belimbur, street performances, art performances, traditional sports, Kutai Folk Festival, Jepen Festival, Ngapeh Festival, torsul, marangin, folklore, entertaining banua, rangga titi beseprah, and stalling dragons (Danandjaja, 2002).

Erau is a huge party for the people of East Borneo, especially all of the people of Kutai Kartanegara, as an embodiment (manifestation) of the deepest expression of gratitude to the Almighty. Erau was first performed at a ground-tread ceremony and bathing on the shore when Aji Batara Agung Dewa Sakti was five years old. "The Jaitan Layar Officials prepared the ground tread (stepping) ceremony, and the Erau took the child to bathe on the shore for the first ceremony." (Adham, 1981). As an adult and appointed as the first king of Kutai Kartanegara (1300–1325), the Erau ceremony was also held by then. Since then, Erau has always been held every time there is a replacement or coronation of Kutai Kartanegara Kings. In its development, the Erau celebration, apart from being the king's coronation ceremony, was also a title-awarding event from the king to the community figures or leaders who are considered to have contributed to the kingdom. "After Paduka Nira was fourteen years old, Babu Jaruma and Nyai Minak Mampi agreed to hold Erau when giving the title Aji Batara Agung to Paduka Nira" (Adham, 1981). The implementation of Erau was carried out by Keraton Palace relatives by inviting all community leaders who served the kingdom. They came from all corners of the kingdom with foodstuffs, livestock, fruits, and also artists. During the implementation of this Erau celebration, the sultan and other Keraton relatives provide a banquet to the people by providing the best possible service as a token of gratitude from the sultan for the dedication of his people. After the end of the Kutai Kartanegara Sultanate's reign in 1965, its territory became an autonomous region, namely, the Kutai Regency. The Erau tradition has been preserved and conserved as a people's party and cultural festival, which is the routine agenda of the Kutai Regency Government in commemoration of the Tenggarong City anniversary, the central government of Kutai Kartanegara Sultanate, since 1782. However, the Sultan of Kutai asked the Kutai Kartanegara government not to eliminate several sacred and obligatory ceremonies. The last practice of Erau according to the customs of the Kutai Kartanegara Sultanate was carried out in 1965, when the ceremony was held for the appointment of the Crown Prince of Kutai Sultanate, Adji Pangeran Adipati Praboe Soerya Adiningrat. Erau celebrations are generally profane and collective in nature. Erau today is a folklore festival packaged by the local government as a tourism destination in the cultural sector. The implementation of the Erau celebration is now part of a tourist destination that is fully organized by the Kutai Kartanegara Regency Government's Culture and Tourism Office in collaboration with CIOFF (International Council of Organizations of Folklore Festivals and Folk Arts) Indonesia, an organization that connects cultures around the world through folklore festivals. The countries participating in the Erau celebration are South Korea, Taipei, Japan, Bulgaria, Slovakia, Poland, India, the Netherlands, Saudi Arabia, Turkey, and so on. Every year, the countries participating in the Erau celebration change. The present Erau celebration is called the Erau International Folk Arts Festival, or EIFAF for short. The purpose of this collaboration between the local government and the CIOFF is to increase the number of domestic and foreign tourists visiting Kutai Kartanegara. The Erau celebration ended with a belimbur ceremony after the dragon stalling ceremony. The belimbur ceremony is the last event in the Erau celebration, which is eagerly awaited by the whole community.

Belimbur has the meaning of cleansing or purifying yourself, which aims to erase all bad traits during the practice of Erau celebration (Bachroel, 2009). The procedure for belimbur is to pour water from the banks of the Mahakam River on the closest people around.

Erau began with a celebration of thanksgiving for the birth of the first king in Kutai Kartanegara. In ancient times, Erau was divided into two, namely, Erau Batu Samban and Erau Tepong Tawar. Erau has the meaning of being crowded, boisterous, and rejoicing. However, Erau in the original Kutai language means annoying or noisy (Bachroel, 2009). The use of the word Erau has changed according to the use and situation that occurs in the Kutai Kartanegara community. Therefore, Erau is defined as having fun. The celebration of Erau in the first royal era was held for 40 days and 40 nights without stopping. Erau was first performed when Aji Batara Agung Dewa Sakti was 5 years old. Erau is a ceremony to step on the ground and deliver Aji Batara Agung Dewa Sakti to the Tepian River. The Erau ceremony was attended by the entire Jaitan Layar community (Kutai Lama, Muara Kaman). In ancient times, the celebration of Erau was obliged to sacrifice the heads of male and female humans and some animal heads, such as buffaloes (Adham, 1981). The heads were covered with yellow cloth, and then Aji Batara Dewa Sakti walked on the heads. Then this first king was paraded, accompanied by the gamelan music of the Gajah Perwata and the canon sound of Sapu Jagat. An Erau celebration was also held at the birth of Karang Melenu's princess, the future wife of the first king, Aji Batara Agung Dewa Sakti. The plot and pattern of Erau celebrations are almost the same as the Erau celebrations that occurred under the first king. However, the Erau celebration of Karang Melenu's princess after "tijak tanah" was carried out in a bepacar ceremony for 3 days and 3 nights. This bepacar ceremony was attended by all the women who lived in Hulu Dusun (Kutai Lama). The ceremony is to paint 10 finger nails and the two big toenails. The purpose of this bepacar ceremony has the meaning of self-cleansing for women so that it looks more charming (Adham, 1981). The celebration of Erau Batu Samban throughout the life journey of the kings or sultans of Kutai was only carried out once. This statement was reinforced by the revelation of the traditional figure Adji Imbran in a 2022 interview in Tenggarong, Kutai Kartanegara.

The Erau that was carried out in ancient times was Erau Batu Samban, but now the Erau that is implemented is Erau Adat Tepong Tawar. The difference between Erau Batu Samban and Erau Tepong Tawar is shown in Table 1 below.

At the end of the reign of King Aji Pangeran Anum Panji Mendapa (1710–1735), the Kutai Kartanegara Kingdom changed to the Kutai Kartanegara Sultanate. This change occurred because the king after Aji Pangeran Anum Mendapa, Aji Muhammad Idris (1735–1778), converted to Islam, so the title of king turned into sultan, the kingdom turned into a sultanate. The change of kingdom to sultanate affected the celebration of Erau. The previous Erau celebration sacrificed humans as a condition, but ever since Kutai Kartanegara became a sultanate, human sacrifices are not permissible as part of the conditions. The only Erau implemented to date is Erau Tepong Tawar. Erau celebrations ended or stopped in 1958, during the reign of the Adji Muhamad Parikesit sultanate (1920–1959) (Imbran, 1989). At this time, Sultan Parikesit handed over the power of his sultanate to the government of the Republic of Indonesia. The Erau celebration was held again in 1991, no longer by the king or sultan but by the regent of Kutai Kartanegara regency, Said Syafran.

Erau adat was restarted during the reign of regent Said Syafran in 1991, and in collaboration with the sultan of Kutai, Adji Pangeran Adipati Praboe Anoem Suerja Adiningrat was hosting the continent, beluluh, bapelas, stalling dragons, and Kutai marriage. The implementation of this customary Erau lasted until 2013. Erau is further divided into Erau Adat Tepong Tawar (EATT) and Erau International Folk Art Festival (EIFAF), as can be seen in Figure 1. EIFAF is a folklore festival packaged by the Kutai Kartanegara regency government to attract local and foreign tourists. EIFAF has been implemented since the reign of regent Rita Widyasari and governor Awang Faroek.

Table 1 Difference between Erau Batu Sambang and Erau Tepong Tawar before the changes

Erau Batu Samban	*Erau* Tepong Tawar	Captions
Celebration was held for 40 days and 40 nights	Celebration was held for 7 days and 7 nights	Erau celebration is joined by the whole community in Kutai Kartanegara
Giving sacrifices as offerings to the gods in the form of 2 humans (male and female) and the head of an odd-numbered buffalo.	Neither gave human or buffalo sacrifices as offerings to gods. Animal sacrifices are only black chickens in the sacred rituals of *besawai (*opening the portal of the door of the supernatural world).	The giving of animal sacrifices is carried out at the time of the ground treading ceremony. To step on the ground is to set foot on the head of the sacrificial offering.

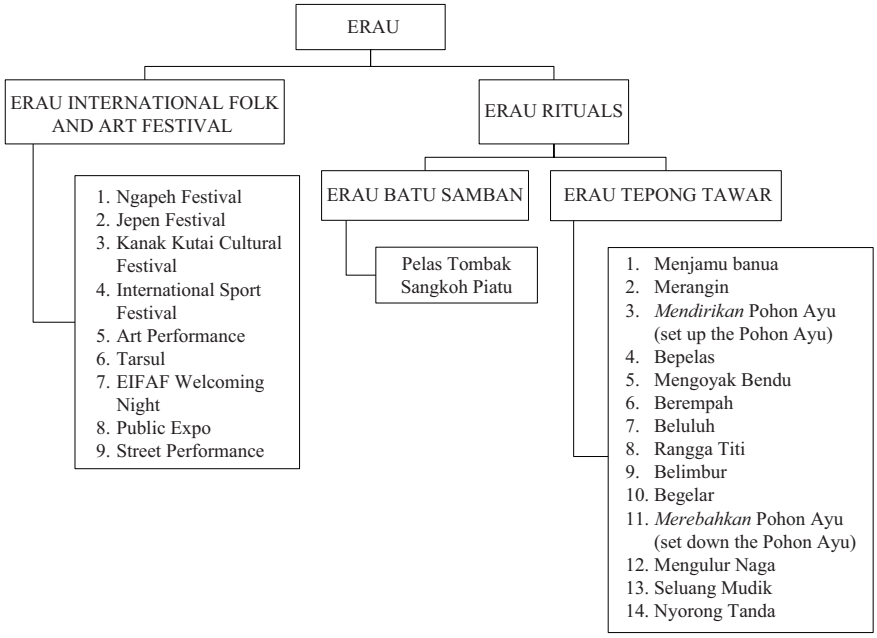

Figure 1 The structure of Erau Festival

Literature Review

Erau Escalation

Since the government launched cultural tourism as part of regional development goals, the government has made tourism policies that are predicted to provide positive energy at various levels, namely, local, regional, and national. Erau escalation is a form of government planning for advancing cultural tourism. The role of the government, through its policies, is to create tourism products that are able to bridge the interests of the relevant sector and its actors (Marimin, 2010). Erau tourism products are the government's efforts to encourage economic development and empower local communities to synergize to form an advanced tourism industry. The collaboration of the community, government, and private sector in this case is CIOFF escalating Erau into EIFAF (Erau International Folklore Arts Festival) and EATT (Erau Adat Tepung Tawar). The two objects that become the packaging of tourism products are marketed through; (1) the exchange of interesting and meaningful information by providing opportunities for local communities to participate in the implementation of the Erau festival. The strategy carried out by the agent (government) is to invite handicraft industry organizations and art communities in Kutai Kartanegara to commit to marketing or promoting tourism products through the creativity of the local community in elevating indigenous cultures that are applied by handicrafts, arts, and tourist destinations. This method is considered effective in encouraging an increase in the selling value of tourism product packaging that is actually offered (Arjana, 2017); and (2) Marketing of tourism product packaging is also carried out through the media. Media communication is considered the fastest way to convey up-to-date information and future information. Media as constructors or shapers, namely, the information conveyed, has great power to influence consumers or travelers through images of tourism products offered so that consumers or travelers become curious to take a closer look (Ibrahim & Bachruddin, 2014). In its prospect, Erau escalation no longer only has use value but has become a promising commercial profit.

Tourism Products

Tourism is an interrelated and geographically complex activity because different services are sought and provided at different levels from place of origin to place of destination (Marimin, 2010). Tourism products are experiences experienced by tourists through sensory and auditory means so that they are meaningful, effective, and valuable experiences in the form of tangibles and intangibles (Arjana, 2017). The activities experienced by tourists directly on tourism products offered by agents and the government are influenced by internal and

external factors in determining the selling price. Internal factors are usually found in local community services that act as a component of marketing tourism products (Erau) (Dines, 2021). An example of internal factors is the community's role as a seller of handicraft goods typical of Kutai Kartanegara with the identity of tourism products (Erau). External factors usually influence the presentation of the tourism product itself and the location of its presentation. For example, street performances featuring dances from various regions originating from Kutai Kartanegara and dances originating from abroad. The location of this performance presentation is along the street of Tenggarong City, Kutai Kartanegara, where the festival takes place. Even though the tourism products that are offered seem prestigious, exclusive, unique, and of high quality, tourists will not be affected. Experience is considered more expensive than souvenir items traded. Erau is the only cultural tourism product with the best packaging in East Kalimantan as an effort to preserve material and immaterial cultural heritage in the form of hereditary cultural traditions carried out by the sultanate and the community. The impact is that economic turnover provides progress for local communities without having to change local identity (Jakae, 2021).

Methodology

The object of research from Erau is the development of Erau into two parts, namely, Erau Adat Tepong Tawar (EATT) and Erau International Foklore Arts Festival (EIFAF), which are made into one packaging of Erau tourism products. Erau tourism product packaging aims to improve the economy of the local community through the diversity of cultural arts that are the flagship of every region in Kutai Kartanegara regency. The form of cultural arts diversity that has been collected into one packaging of tourism products in the form of traditional arts, traditional sports, Kutai souvenirs, local traditional culture, foreign cultural arts, and others through Erau is carried out by the Kutai Kartanegara regency government as a destination for developing the potential and competitiveness of cultural tourism destinations. In an effort to preserve old culture, develop tourism products, and improve the economy of local communities, the government collaborated with CIOFF (Counselor International of Folklore Festival) with the approval of the Kutai Sultanate. The government's goal in managing Erau is that it can penetrate the international scene. The notion of tradition is a powerful instrument in the construction of hegemony (Mosco, 2009). The transformation from a sacred traditional ritual Erau to an Erau festival and a traditional Erau is part of a cultural commodification that results in a profitable selling point for local communities and the government that has become Erau's managing agent. The profit from this product is nothing but for the prosperity of the community itself. Cultural tourism through the Erau festival has a positive impact on improving the local creative culture economy. A significant positive impact can be seen in the enthusiasm of the Dayak community, Kutai, and even other tribes participating in the Erau festival activities through the cooperation of the government, sultanate, and CIOFF.

The present research employs a qualitative research method to examine the characteristics, properties, circumstances, images, and quality of the Erau as the object under study. The thick description method is a method of observation that is carried out in-depth through the observation of the behavior of the Erau perpetrator, the status of the community participating in the celebration, a system of thought, symbols contained in Erau, and the thought of the perpetrator and society today. The thick description theory is considered the most appropriate observation in this study (Geertz, 1973). This research uses qualitative research based on cultural concepts. The reading of the implementation of Erau becomes an observation and an in-depth understanding. The techniques are carried out by observing behaviors and symbols in Erau and conducting structured and unstructured interviews with Erau actors and resource persons who know in-depth about the process of implementing Erau. Observations were made in real-time, and researchers became part of the implementation of Erau. Therefore, this study clearly describes Erau's condition. The informant gave answers in the form of responses. Erau information is based on myth and factual conditions, views about Erau, people's attitudes about Erau, Kutai people's expectations of the existence of Erau, and Erau as a tourism product. The resource persons as data boosters consisted of community leaders, Erau perpetrators, non-participating communities, relatives of the sultanate, guests, sultans, and government parties involved. The results of observation or data search based on in-depth interviews and data search through literature are managed and analyzed based on category, comparison, and contrast, then interpreted. Interpretation of the data obtained is considered by other factors that are intertwined with the patterns of thought of the people, sultanates, and governments. These other interrelated factors are studied based on the perspective of local people's thinking, not on the researcher's frame of mind. Hence, the data can be easily turned into accurate analysis data.

To gather enough comprehensive data, we performed a literature study, engaged in participant observation fieldwork, and conducted interviews. Through interviews, we sought original sources from elders who understand the origin of Erau. The speakers included members of the sultan's family, namely: (1) Prince Harry, who served as secretary of the palace during Sultan Salehudin's reign; (2) Prince Sumantri, a cousin of the Sultan; (3) Aji Imbran, who was secretary of the palace during Sultan Parikesit's reign; (4) children and grandchildren of Sultan Salehudin; (5) the Tenggarong community; and (6) civil servants. Interviews were conducted in both structured and unstructured formats, depending on circumstances and situations.

We conducted observation by participating as participants in Erau Adat Tepong Tawar and Erau International Folk Art. The researchers followed the course of the event according to the schedule that had been made by the government and the Kutai palace. The researchers followed from the first day to the final day of Erau and its implementation for one week.

1. Documentation. Images and films were taken from real events that took place on the ground without any engineering.
2. Literature review. Palace manuscript books and some articles supporting the news about Erau.

Results

The development of cultural tourism in the form of the Erau festival contributes significantly to the improvement of the economy of local communities that indirectly rely on Erau as a livelihood. Intellectual capital, cultural capital, and commodified creative capital produce high-value cultural products in the form of the Erau International Folk Art Festival (EIFAF). The development of culture into a cultural product of tourism creative economy value carried out by the government, sultanates, and the private sector has an impact on the local economy, human resources, creative economy products produced, and local cultural arts. The driving actors of the creative economy in the tourism industry, consisting of intellectuals, governments, and entrepreneurs, are called triple helix systems. In this system, the three actors play an important role in the development of an economy based on knowledge, art, tourist destinations, and culture towards tourism innovation that has high selling value and economic potential (Etzkowitz, 2008). Based on the analysis of the facts contained in the field, it can be stated that Erau is a tourism product that has a selling value as a promising tourism commodity for the local community and the Kutai Kartanegara regency government. Commodities in the form of Erau cultural products packaged in local cultural dressing that is commodified with modern packaging without leaving the original identity are characteristic of the selling point of tourism products as tourist destinations that should be taken into account.

Discussion

Based on the results of research conducted in Kutai Kartanegara, East Kalimantan, during the Erau festival, it was found that there was a connection between the local government, sultanate, and private agents who cooperated in organizing the Erau festival with similar progress and goals (see Figure 2). The progress and objectives are:

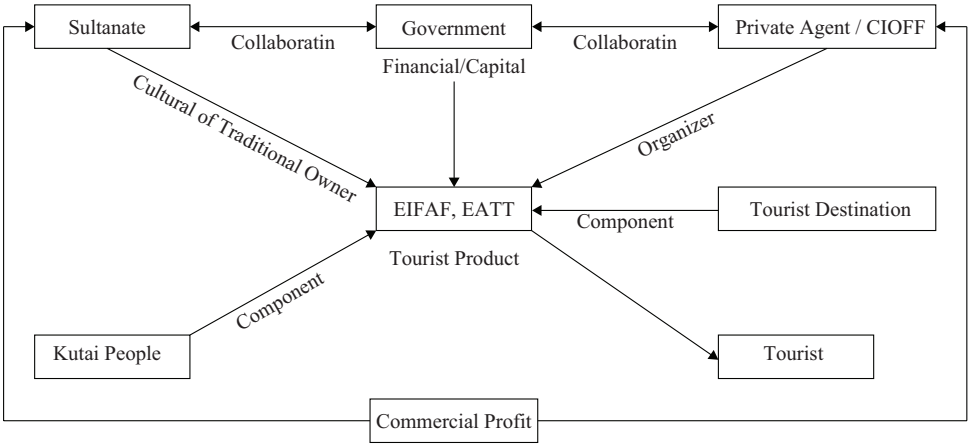

Figure 2 Erau's commercial profit

1. The government is the main financier in organizing the Erau festival (Bourdieu, 1993). The Erau Festival, as explained above, is in the city of Tenggarong Kutai Kartanegara. Tenggarong City is the capital of Kutai Kartanegara regency. Erau Festival is an annual festival that involves the Kutai community, in particular, and the Indonesian people in general. The Erau Festival is a program of the Cultural Education and Tourism Office of Kutai Kartanegara Regency as a tourism product in the field of culture. The government believes that, along with the development of the tourism industry, the Erau festival can be used as a tourist destination and a promising tourism product.

2. The government wants the implementation and organization of the Erau Festival to involve all local civil servants and state civil servants who are obliged to participate. The government encouraged local civil servants and state civil servants to participate in various activities at the Erau festival. The obligation of local civil servants and state civil servants to participate in the Erau festival is part of the government's efforts to restore the capital that has been spent in the implementation of Erau and help the economic turnover of the people, for the people, and by the people. Local civil servants and state civil servants who are required to participate aim to help promote and persuade the public to contribute to the various activities at the Erau Festival as an economic driver in every Erau Festival activity. This effort is considered very significant because the interest in participating in the Erau festival every year has developed.

3. Representation of Erau festival as an icon of cultural arts in Kutai Kartanegara. The organization of the Erau festival, which is assembled with the Erau International Folk Art Festival, is an alternative to increase tourism and improve the regional economy. Erau, as a leading cultural art icon, indirectly evokes the local economy. The commercialization of Erau cultural arts can build the reputation of Kutai Kartanegara regency through tourism products and tourist destinations offered by the government.

4. Erau Festival as a tourism product. Erau is packaged in one interesting cultural arts package. There are various performances presented, namely, the Ngapeh festival, the Jepen festival, traditional sports, the local community UMKM (Micro, Small, and Medium Enterprises) expo, traditional ceremonies, etc. This tourism product packaging is offered to tourists as tourism destinations and private entrepreneurs engaged in tourism as a step by the government in collaboration with the sultanate to advance local cultural arts that have high selling value.

5. Erau Festival as an economic driver of Kutai Kartanegara regency. Erau evoked an economic turnaround that almost sank the Kutai Kartanegara district. The existence of Erau is very important for local people who rely on Erau as a center for money turnover. Erau as a tourism product can maintain its identity and improve the local economy. The existence of Erau is increasingly famous in the national and international arenas, so the selling value of Erau as a tourism product will also experience a significant increase.

6. The perception and response of the Kutai community are that they are supporters of the Erau festival. The local people of Kutai Kartanegara are eager every year to wait for the Erau festival. The Kutai people's support is prominent for Erau. The purpose of holding Erau since the beginning of Aji Dewa Sakti's reign has been from the people, for the people, and by the people.

Conclusion and Recommendation

Departing from the above explanation, it can be concluded that: (1) the traditional Erau accompanied by the Erau festival in the form of the Erau International Folk Art Festival (EIFAF) is a unit packaged into a tourism product highlighting the values of local wisdom and highlighting the commercial side of the creative economy for the local community to help the welfare of the Kutai community directly; (2) the commodification that occurred in Erau helped Erau's existence as a profitable tourism product for intellectuals, governments, and entrepreneurs in the tourism sector; and (3) Erau is a superior tourism product that promises to support the Kutai Kartanegara regency government's program towards development and the economy as a whole.

Conflict of Interest

The authors declare that they have no conflicts of interest.

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The influence of mental health on life satisfaction mediated by self-rated health: A study of Thai older adults

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self-rated health

Abstract

This study aimed to validate a model that explored the relationship between mental health and life satisfaction, with self-rated health acting as a mediator. Secondary data from the 2021 research project "Health, Aging, and Retirement in Thailand (Wave 3)" were analyzed. The sample consisted of 3,156 respondents aged 50 years and older. The research findings revealed that mental health indirectly affected life satisfaction (β 0.376). Additionally, self-rated health directly affected life satisfaction (β 0.794) and mediated the relationship between mental health and life satisfaction among Thai older adults. These results suggested that the model aligned well with the empirical data. Data analysis enables policymakers and health professionals to effectively make evidence-based decisions that address social and health issues.

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Introduction

Statement of the Problem

The global elderly population is experiencing a rapid increase. Between 2000 and 2014, the number of older adults surged from 418 million to 588 million, with an annual growth rate of 2.4 percent over 14 years. In contrast, the global population growth rate has declined to 1.2 percent (United Nations Department of Economic and Social Affairs, Population Division, 2024). According to a study by Lattman et al. (2019), people worldwide live longer than ever. Furthermore, the proportion of older adults in the global population is expanding exponentially (Celik et al., 2018; Lattman et al., 2019). In 1950, individuals aged over 60 represented just 8.6 percent of the global population. Totaling more than 384 million. Today, the proportion has risen to 12 percent, encompassing over 900 million individuals. The projections suggest that by 2050, older adults will constitute 22 percent of the world's population.

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Celik et al. (2018) posit that the aging population represents the most significant demographic shift currently underway. From a demographic perspective, developed countries have already shown substantial proportions of older adults. In 2017, 25 percent of Europe's population and 21 percent of Russia's population were aged 60 and above, according to (United Nations Department of Economic and Social Affairs, Population Division, 2019). These percentages are projected to escalate to 34 percent in Europe and 28 percent in Russia by 2050. Meanwhile, Thailand is undergoing a remarkable expansion in its elderly population. The proportion of individuals aged 60 and over skyrocketed over half a century, increasing from a mere 1.2 percent in 1960 to 8.3 percent in 2010. The Foundation of the Institute of Gerontology Research and Development anticipated that by 2031, Thailand will evolve into an 'advanced aging society,' with older people constituting more than 28 percent of the population (Phungviwatnikul & Voraprateep, 2024).

Due to the rapid expansion of the aging population, issues related to mental health and quality of life have gained increased prominence among older adults compared to other age groups (Celik et al., 2018; Lattman et al., 2019). Mental health significantly influences the overall well-being and functionality of older adults. (Muñoz-Bermejo et al., 2020), as poor mental health can lead to increased morbidity, decreased physical health, and a reduced ability to engage in social activities. Research indicates that mental health problems, such as depression and anxiety, are prevalent among older adults and can adversely affect their life satisfaction and perceived quality of life. (Öztop & Kınacı, 2016) Furthermore, self-rated health is a strong predictor of health outcomes in this demographic, as it reflects individuals' perceptions of their health status and is associated with mortality and disability (Kutubaeva, 2019). Given these factors, understanding the determinants of life satisfaction in older adults is crucial for societal progress. It can inform targeted interventions to improve their mental health and overall quality of life.

Recent research primarily focuses on variables that contribute to the Life satisfaction of older adults (Öztop & Kınacı, 2016), including factors such as gender, educational level, familial relationships, self-esteem, societal roles, income, social support, community engagement, and geographical variables. However, there is an urgent need for more comprehensive investigations into the complex interrelationships between mental and physical determinants that influence life satisfaction (Celik et al., 2018), given the existing gap in Thai research concerning the interplay among life satisfaction, mental health, and self-rated health. Therefore, this study aims to explore these interconnections, particularly emphasizing self-rated health as a mediating variable.

The Research Questions

While many studies suggest a direct relationship between the mental health and life satisfaction of older individuals, the present research proposes a more nuanced interplay between these dimensions (Puvill et al., 2016; Reyes Fernández et al., 2016). Specifically, this study seeks to validate a model in which factors related to mental health influence life satisfaction, with self-rated health as a mediating variable. The conceptual framework for this investigation was informed by the findings of 'The Influence of Physical and Mental Health on Life Satisfaction is Mediated by Self-Rated Health: A Study with Brazilian Elderly' (Pinto et al., 2016). As shown in Figure 1, this framework is particularly significant in the Thai context, as it highlights the interplay between physical and mental health and its impact on life satisfaction among the elderly population in Thailand. Given the increasing aging population in Thailand, understanding how these health factors influence life satisfaction is crucial for developing targeted interventions and policies.

Research Objectives

This study aims to validate a model in which mental health variables influence life satisfaction, with self-rated health functioning as a mediating variable.

Hypothesis

Hypothesis 1: Mental health affects the life satisfaction of older adults.

Hypothesis 2: Self-rated health affects the life satisfaction of older adults.

Hypothesis 3: Self-rated health mediates the relationship between mental health and the life satisfaction of older adults.

Conceptual Framework of the Research

Figure 1 Mediating effect of self-rated health on the relationship between mental health and life satisfaction

Literature Review

The literature review is structured into two primary sections. The first section presents the operational definitions of the dependent variable, life satisfaction, alongside the independent variables, mental health and self-rated health. This section provides a comprehensive understanding of how these constructs are defined and measured within the existing literature. The second section examines the relationships between the independent variables and the dependent variable, highlighting key findings and trends observed in prior research.

Operational Definition of Life Satisfaction

Numerous studies investigating the determinants of well-being and life satisfaction have consistently portrayed life satisfaction as a concept with multiple dimensions (Bratt et al., 2017; Dumitrache et al., 2018; Öztop & Kınacı, 2016; Park & Lee, 2017). Life satisfaction has been assessed using eight distinct items that delve into the diverse facets of the experiences of older people (Park & Lee, 2017). In light of the existing literature, there is a prevailing agreement among researchers that life satisfaction is a nuanced and multifaceted construct, making its precise measurement a formidable task.

The nexus between life satisfaction and health is well-established. Mroczek and Spiro (2005) delineated a significant correlation between life satisfaction and detrimental health outcomes. It is imperative to note that health determinants can be categorized into two primary domains: physical and mental health. The latter is often referred to as emotional well-being. Adams et al. (2016) emphasized life satisfaction as an integral component of comprehensive well-being, conducting extensive research on the elements that bolster physical, social, and mental health. Öztop and Kınacı (2016) contend that life satisfaction reflects an individual's holistic feelings towards life and self-esteem as an essential indicator of emotional well-being.

Recent scholarly inquiries have delved into the nuanced relationships between life satisfaction and physical and mental health dimensions (Matud et al., 2019). As Öztop and Kınacı (2016) articulated, life satisfaction encompassed a holistic contentment that surpassed ephemeral situational joys. This profound contentment indicates sound mental health, containing happiness, motivation, enduring social engagements, and graceful aging processes. Such observations highlight the burgeoning academic curiosity regarding the distinct influences of physical and mental health on life satisfaction.

Adams et al. (2016) contended that life satisfaction is intrinsically linked to subjective well-being. Rooted in individual perceptions and judgments, the present research utilizes subjective assessments to measure an individual's level of life satisfaction. Reinforcing this perspective, Öztop and Kınacı (2016) expounded that life satisfaction was contingent upon an individual's ability to appraise various facets of life quality favorably. Fundamentally, the degree of life satisfaction was connected intimately to one's evaluations and introspections.

Life satisfaction is a comprehensive measure that reflects an individual's ability to evaluate determinants of life quality, including familial relationships, educational experiences, and social interactions based on personal benchmarks (Hayat et al., 2016; Tomini et al., 2016). A study conducted by Yeo and Lee (2019) shows that elderly individuals residing with their families demonstrated higher levels of life satisfaction. Furthermore, physical and mental health conditions significantly influenced life satisfaction.

Life satisfaction is pivotal in promoting optimism and augmenting the quality of life (Matud et al., 2019; Yeo & Lee, 2019), particularly within an aging demographic. Yeo and Lee (2019) underscored that life satisfaction is often utilized as an indicator to assess an individual's overall quality of life. Conversely, Bao et al. (2013) posited that life satisfaction and quality of life were not distinct entities but rather interrelated concepts.

Life satisfaction encompasses various dimensions, including physical health, mental well-being, familial relationships (Szcześniak & Tułecka, 2020; Zarei & Fooladvand, 2022), economic status (Owusu, 2021; Rajabi Gilan et al., 2021), and overall quality of life (Malvaso & Kang, 2022; Ruggeri et al., 2020). These facets were assessed across the six dimensions of the questionnaire.

Operational Definition of Mental Health and Self-rated Health

As individuals age, they confront various challenges, including complex health issues, unemployment, and personal losses. These adversities can significantly impact their mental well-being and overall quality of life (Celik et al., 2018; Reyes Fernández et al., 2016). The World Health Organization's (WHO) definition is the most widely accepted characterization of mental health. The WHO defines mental health as a state of

well-being in which the individual realizes their abilities, can cope with the everyday stresses of life, work productively and fruitfully, and contribute to their community (World Health Organization, 2004). The WHO distinguishes mental health into biomedical attributes and socio-cultural dimensions. Many scholars argue that societal factors are crucial in shaping our understanding of mental health. For example, some researchers posit that concepts related to mental health and illnesses extend beyond individual attributes and intertwine with diverse societal contexts (Dumitrache et al., 2018; Granlund et al., 2021; Manwell et al., 2015; Palumbo & Galderisi, 2020).

The prevailing scholarly consensus highlights the importance of prioritizing personal subjective experiences in discussions related to mental health. Palumbo and Galderisi (2020) have advocated that fundamental concepts of mental health should be grounded in the firsthand experiences of individuals coping with mental disorders. A recent comprehensive psychological survey encompassing 31 different topics underscored the foundational role of personal sentiments in the realm of mental health. Furthermore, it reinforces the central position of individual subjective feelings within the discourse on mental health (Manwell et al., 2015).

Anxiety and depressive states merit significant attention, particularly considering that only a tiny fraction of individuals suffering from depression receive accurate diagnoses (Reyes Fernández et al., 2016). The mental health parameters under consideration encompass elements such as emotional detachment from one's surroundings, difficulties in concentration, fluctuating emotional states, disruptions in sleep patterns, experiences of loneliness, feelings of diminished self-worth, and pervasive disappointment—the mental health assessments in this study based on examining these dimensions.

Relationships between Variables

Relationship between mental health and life satisfaction

The relationship between mental health and life satisfaction is inherently reciprocal. Numerous studies support the notion that variations in life satisfaction can reciprocally influence mental health (Dumitrache et al., 2018; Xie, 2018). The enhancement of positive psychological elements, such as life satisfaction and overall quality of life, has the potential to concurrently alleviate symptoms associated with mental health challenges and sleep disorders. Öztop and Kınacı (2016) have identified life satisfaction as a paramount determinant of an individual's mental health, particularly within the context of senior citizens. This observation consisted of findings related to their mental and physical well-being (Arpacıoğlu et al., 2021; Dumitrache et al., 2018; Zullig et al., 2006).

Several studies indicate the profound impact of mental health and negative emotional states on life satisfaction. Adams et al. (2016) observed that anxiety could have a detrimental effect on life satisfaction, while indicators of depression consistently demonstrated a negative correlation with life satisfaction metrics. Xie (2018) highlighted that reduced life satisfaction among older adults was associated with an increased risk of mental health issues. Past investigations have shed light on the intricate interplay between physical and mental health as multifaceted determinants. Yeo and Lee (2019) concluded that two primary factors, physical health and depression, significantly influenced life satisfaction. Notably, Bao et al. (2013) determined that depressive tendencies were formidable predictors of life satisfaction. Concurrently, other researchers have emphasized that the absence of anxiety and depressive symptoms was crucial for enhancing life satisfaction in older adults.

Interestingly, it is evident that mental health exerts a more pronounced influence on life satisfaction when compared to physical health. Puvill et al. (2016) observed that a decline in physical health rarely correlated strongly with diminished life satisfaction. In contrast, adverse mental health consistently showed a robust association with reduced life satisfaction, highlighting that, among older adults, mental health assumes a more pivotal role in shaping life satisfaction than physical health.

Nexus between Self-Rated Health and Life Satisfaction

A substantial body of research emphasizes the robust correlation between self-rated health and life satisfaction, particularly among older adults (Berg et al., 2006; Berg et al., 2009; Gerstorf et al., 2008; Hsu, 2012; John & Montgomery, 2010). Kutubaeva (2019), for instance, pinpointed self-rated health as a pivotal factor influencing life satisfaction. This profound linkage was corroborated by empirical evidence from Swedish datasets, encompassing individuals aged 65–89 who exhibited reduced self-sufficiency (Berg et al., 2006).

Numerous studies consistently suggest that higher self-rated health positively correlates with life satisfaction. Adams et al. (2016) highlighted that improved self-rated health coincided with increased life satisfaction. Furthermore, Reyes Fernández et al. (2016) asserted in their research that self-rated health emerged as a primary determinant of life satisfaction.

It is imperative to note that subjective perceptions may not always coincide with objective health measures (Petrie & Weinman, 2006). Such incongruence primarily stems from the fact that self-rated health hinges on individuals' subjective appraisals, typically solicited through questions such as 'In general, how would you rate your health?'. Various factors can influence these evaluations, among which individual mindsets stand out. Two prominent mindsets have been identified within theoretical frameworks: Growth and fixed (Dweck, 2012). The growth mindset encapsulates a proactive approach, marked by a readiness to tackle challenges and a continuous pursuit of learning. The influence of these mindsets on perceptions of self-rated health is undeniable. Dweck (2012) suggested that those with a growth mindset frequently demonstrate a more precise self-evaluation of their health status.

Methodology

This study employed a quantitative research design, utilizing secondary data from the 2021 "Health, Aging, and Retirement in Thailand (Wave 3)" survey. The primary aim was to examine the relationship between mental health and life satisfaction among older adults, with self-rated health serving as a mediating variable. A sample of 3,156 individuals aged 50 years and above was analyzed to validate the proposed model. Advanced statistical methods, including path analysis, were used to explore mental health's direct and indirect effects on life satisfaction. This methodological approach provided a comprehensive understanding of how these variables interact within the Thai elderly population.

Research Questionnaire

Life satisfaction

The Life Satisfaction Questionnaire is grounded in Diener's theory of Subjective Well-Being (SWB) (Diener, 1984), which posits that life satisfaction is a cognitive evaluation of one's overall life circumstances rather than based on momentary emotions or affective states. It incorporates four salient domains: physical health, mental health, family economy, and overall quality of life. Respondents are encouraged to assess their satisfaction within each domain using a scale of 0 to 10. In this context, a score of 0 indicates dissatisfaction, whereas 10 represents the pinnacle of contentment. As a construct, life satisfaction has gradually solidified its status as an indispensable metric in well-being assessment. Rigorous empirical evaluations affirm the reliability and precision of this instrument. Furthermore, it is noteworthy that its applicability and consistency remain steadfast across diverse temporal and geographical landscapes.

Mental health

The World Health Organization's (WHO) definition of mental health supports a specialized Mental Health Questionnaire. WHO defines mental health as a state of well-being where individuals realize their abilities, cope with life's normal stresses, work productively, and contribute to their community. This questionnaire evaluates dimensions such as emotional states, feelings of stress, loneliness, and self-esteem, reflecting the multi-dimensional nature of mental health as proposed by WHO. The assessment tool employs a scale ranging from 0 to 10, wherein 0 signifies the complete absence of the corresponding emotion, and a score of 10 implies a persistent and daily experience.

Self-rated health

The self-rated health scale is based on Social Cognitive Theory (Bandura, 1986), which emphasizes that individuals' subjective health evaluations significantly influence their health behaviors and outcomes. Despite its brevity, comprising only two items, it delivers a comprehensive assessment. Participants are instructed to evaluate their health status using a scale from 0 to 10. A score of 0 indicates poor health, while a score of 10 exemplifies an individual at the pinnacle of health. This concise yet powerful questionnaire provides invaluable insights into how individuals perceive their health, independent of medical diagnoses or clinical evaluations.

Evaluation of Questionnaire Quality

Confirmatory Factor Analysis (CFA) was employed to evaluate questionnaire quality. The results indicated suitable factor loadings of observed variables for each respective component and appropriate Model Fit Indices, as shown in Table 1 and Table 2.

Table 1 Model fit indices of measurement model

Model	χ^2	*df*	*p*	χ^2/df	RMSEA
Initial model	4384.02	132	.00	33.21	0.101
First revised	3033.79	132	.00	22.98	0.084
Final revised	2623.22	126	.00	20.81	0.079

Table 2 Confirmatory component analysis results of the measurement model - construct reliability (ρ_c), average variance extracted (ρ_v), and variable precision (R^2)

Variable	Factor loading	ρ_C (CR)	ρ_V (AVE)	R^2
Self-rated health		0.98	0.96	
Self 1	0.934**			0.391
Self 2	1.105**			0.159
Life satisfaction		0.99	0.95	
Life 1	1.185**			0.523
Life 2	1.256**			0.651
Life 3	0.785**			0.143
Life 4	0.903**			0.107
Life 5	0.753**			0.206
Life 6	1.068**			0.448
Mental health		0.99	0.95	
Mental 1	0.435**			0.425
Mental 2	0.374**			0.391
Mental 3	0.380**			0.312
Mental 4	0.377**			0.159
Mental 5	0.388**			0.340
Mental 6	0.373**			0.509
Chi- Square = 2623.22 *df* = 126 *p* = .000 Chi- Square/*df* =20.81 RMSEA = 0.079				
** = *T*-Test (*p* value < .01)				

Self 2 exhibits the highest component weight at 1.105 in the Self-rated Health. It is closely followed by a component weight of 0.934 for Self 1, particularly when considering the coefficient of reliability (R^2) between the observed variables and the primary component. The data indicate that this specific composite component mainly explains the variability in Self 1, accounting for approximately 39 percent of its variance.

In Life Satisfaction, Life 2 presented the highest factor loading, registering at 1.256, closely followed by Life 1, which weighed 1.185. Significantly, these components primarily explained the variance of Life 2 and Life 1, contributing to a considerable 65.1 percent and 52.3 percent, respectively.

Within the composite components related to mental health, Mental 1 had the foremost weight, posting a value of 0.435, followed by Mental 5, which weighed 0.388. Notably, these standardized components elucidated the variance most prominently in Mental 6, accounting for 50.9 percent, while the variance explained by Mental 1 was 42.5 percent.

Upon comprehensive analysis of this measurement model, it became evident that every observed variable within the collective components had a factor weight loading above 0.3. The factor loading higher than 0.3 is considered statistically significant, indicating that the observed variable can represent the latent factor to a certain extent. This standard is based on an empirical rule (Hair et al., 2013). Additionally, these loadings were statistically significant at the .01 level, emphasizing their appropriateness in measuring each communal component effectively.

Furthermore, the model's examination suggests that the latent variable's reliability (Construct Reliability: P_C) is above 0.6. A Construct Reliability value exceeding 0.6 indicates good internal consistency of the model, making it suitable for research purposes (Kline, 1999).

The Average Variance Extracted (AVE) exceeding 0.5 reinforces the assertion that the measurement model was suitable for research pursuits. When the AVE value exceeds 0.5, it implies that the observed variables can explain more than 50 percent of the variance of their latent factor (Fornell & Larcker, 1981), thereby reinforcing the suitability of the measurement model for research pursuits.

Data Collection

This research utilized secondary data from a survey targeting urban and rural elderly populations in Thailand as part of the Health, Aging, and Retirement in Thailand (HART) project, a sister study of the Health and Retirement Study (HRS) conducted by the Institute for Social Research (ISR) at the University of Michigan. Since 2009, this project has been collaboratively conducted by researchers and faculty from the Research Center, School of Applied Statistics, School of Development Economics, and the School of Social Development, Intelligence, and Information Center (NIDA IIC) under the Center for Aging Society Research (CASR) at the National Institute of Development Administration (NIDA). For this study, we utilized data from HART Wave 3, which included 3,156 respondents aged 50 years and older. The study was approved by the Ethics Committee in Human Research at NIDA under the title

"Health, Aging, and Retirement in Thailand (HART): Wave 3," with ethical approval granted under COA No. 2020/0010 and Protocol ID No. ECNIDA 2020/0012. The approval was issued on March 11, 2020, and remained valid until March 10, 2021, ensuring compliance with international ethical standards such as the Declaration of Helsinki, CIOMS Guidelines, and the Belmont Report.

The comprehensive survey questionnaire covered a range of areas such as family status, health status, employment information, financial aspects, personal views, future expectations, and life satisfaction. For the objectives of this research, the primary focus was data from the health status and life satisfaction sections.

Data Analysis

In this study, we conducted a nuanced examination to understand the mediating influence of self-rated health on the correlation between mental health and life satisfaction, explicitly focusing on the elderly Thai population by applying the Path Analysis Model. Through this methodological approach, the study aimed to illuminate potential pathways and dynamics that connect mental health and life satisfaction, with self-rated health playing a pivotal role as an intermediary factor.

Results

Among the respondents, the majority were female, accounting for 59.3 percent of the total, while males made up 40.7 percent. The average age was 71.5 years. Regarding marital status, 56.8 percent were married, while 37.6 percent were widowed, divorced, or separated. In terms of education, most respondents (75.9%) had completed primary school, while 5.6 percent had no formal education. Additionally, 91.3 percent identified as Buddhist, followed by 8.1 percent Muslim. The average monthly income of the respondents was 3,441 baht.

As evident from Table 3, both self-rated health and life satisfaction were influenced by hypothetical variables. Specifically, mental health directly impacted self-rated health, demonstrating a coefficient of influence of 0.473 (p value < .01), accounting for 23.4 percent of the variance in self-rated health (R^2 = 0.234).

Additionally, self-rated health directly influenced life satisfaction with a coefficient of 0.794 (p value < .01). Indirectly, life satisfaction was influenced by mental health, with a coefficient of 0.376 (p value < .01). Collectively, the mental and self-rated health variables explicated 65 percent of the variance in life satisfaction (R^2 = 0.654).

An illustration depicting the mediating effect of self-rated health on the interplay between mental health and life satisfaction is presented in Figure 2. Additionally, mental health exerts both direct and indirect effects on life satisfaction. The indirect influence implies a mediating role of self-rated health in linking mental health to the life satisfaction of older Thai adults. From a model fit perspective, a RMSEA value below 0.05 indicates a satisfactory fit (χ2: 556.15; χ2/*df*: 8.205; p = .000; largest standard residual: 5.274; RMSEA = <0.048).

Table 3 Regression analysis results in structural equations

IV		Dependent variables	
	Effect	Self-rated health	Life satisfaction
Mental health	DE	0.473**	0.031
	IE	--	0.376**
	TE	0.473**	0.407**
Self-rated health	DE	--	0.794**
	IE	--	--
	TE	--	0.794**
R^2		0.234	0.654

Note: *p < .05 ** p < .01 (DE = Direct Effect, IE = Indirect Effect, TE = Total Effect)

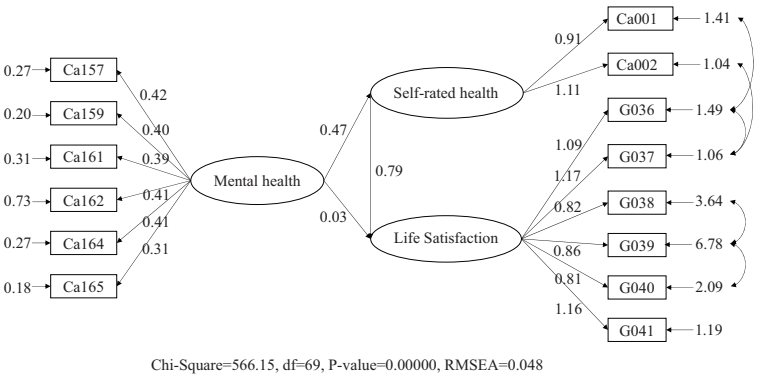

Figure 2 Illustrates the mediating effect of self-rated health on the interplay between mental health and life satisfaction
Note: Chi-Square = 566.15, *df* = 69, p value = .00000, RMSEA = 0.048

Discussion

The outcomes from our research revealed an indirect effect of mental health on life satisfaction by passing self-rated health and a direct effect on self-rated health, even though it did not directly affect life satisfaction itself. A plausible explanation is that self-rated health hinges on individuals' subjective appraisals that can influence self-evaluations, among which individual mindsets stand out (Petrie & Weinman, 2006). Therefore, good mental health reflects a high life satisfaction score by passing self-rated health.

The Direct Effect of Mental Health on Life Satisfaction Appears Negligible

Recent research has shown that physical and mental health significantly impact life satisfaction. For instance, Yeo and Lee (2019) identified physical health and depression symptoms as pivotal determinants of life satisfaction. In alignment, Xie (2018) observed a correlation between diminished life satisfaction among older adults and an increased prevalence of mental health issues. Furthermore, Bao et al. (2013) recognized depression symptoms as a primary indicator of life satisfaction levels. Supporting these findings, Adams et al. (2016) and Puvill et al. (2016) reported negative correlations between mental health disturbances and life satisfaction within the elderly population. These studies collectively confirm the significant relationship between the mental health of older individuals and their overall life satisfaction.

Interestingly, our observations present a more complex relationship compared to the consensus of previous studies. While earlier research has emphasized the significant role of mental health in life satisfaction, our findings suggest that the direct impact of mental health on life satisfaction in older adults may be less pronounced. This could be attributed to the fact that older individuals might prioritize concerns about their physical health over mental health issues. Consequently, it appears that physical health plays a more pivotal mediating role in the relationship between mental health and life satisfaction, rather than mental health serving as a direct predictor of life satisfaction. This indicates that addressing physical health concerns may be more relevant in understanding and enhancing life satisfaction among older adults.

A reasonable explanation for our contrasting findings might be that life satisfaction in older adults only declines when mental health problems reach a severity that interferes with daily activities. In situations where mental health issues are moderate or mild, life satisfaction could largely remain stable.

The Profound Impact of Self-rated Health on Life Satisfaction in Older Adults

The study's results align with previous research, highlighting the positive correlation between self-rated health and life satisfaction among the elderly. For instance, Matud et al. (2019) clarified the relationship between life satisfaction and three key factors: self-rated health, sleep quality, and participation in daily activities among the elderly. Further examination of the literature reveals Adams et al. (2016) and Kutubaeva (2019) emphasized the strong connection between individuals' perceptions of health and life satisfaction. These findings collectively highlight the critical role of self-rated health as a key determinant of comprehensive life satisfaction experienced by older adults.

The Mediating Role of Self-rated Health between Mental Health and Life Satisfaction in Older Adults

The results of the research indicate that the life satisfaction of older adults tends to decline when mental health issues significantly impact their self-rated health. This conclusion distinguishes from previous studies by uncovering the mediating role of self-rated health, highlighting how it significantly influences the connection between mental health and life satisfaction. This discovery suggests that prior research may have underestimated the importance of self-rated health as a crucial factor in this relationship.

Carol's research on mindsets offers valuable perspectives on this relationship, distinguishing between fixed and growth mindsets. She finds that a fixed mindset is associated with higher depressive symptoms (Dweck, 2012). This rigid self-perception can lead to distorted mental health. In contrast, individuals embracing a growth mindset demonstrate greater resilience and a more accurate mental health assessment, contributing to enhanced life satisfaction. Carol's research highlights the essential impact of mindset on the dynamics of self-rated health, mental health, and life satisfaction.

Conclusion and Recommendation

Conclusion

The essence of our research lies in the intricate interplay among mental health, self-rated health, and life satisfaction. The significance of mental health on life satisfaction cannot be understated; it is not the sole driver of life satisfaction, whereas self-rated health plays a mediating role between mental health and life satisfaction. It is imperative to understand that life satisfaction is a composite entity with multifarious determinants. While mental health undeniably remains central to this equation, self-rated health seamlessly bridges the gap, serving as the critical link between mental health and holistic life contentment.

Recommendations

The implications of self-rated health are pronounced in deciphering how health adversities impact the life satisfaction of older adults. This subjective measure of health, derived from an individual's evaluation, mirrors internalized experiences and perceptions concerning their well-being. Given its evident significance, there is a pressing need to amplify the focus on self-rated health. This metric is instrumental in comprehending the nuances of how mental health concerns shape the contours of life satisfaction. Such introspection becomes even more pertinent when considering the unique mental health challenges faced by older adults, which often have a direct bearing on their quality of life.

In light of these findings, we strongly advocate for increased research on self-rated health among older populations. By exploring this aspect further, policymakers, healthcare professionals, and community leaders can develop innovative strategies to improve health outcomes and overall well-being in this demographic. For example, tailored health programs that integrate mental health support with physical health monitoring can be implemented in healthcare settings. Additionally, community-based initiatives such as wellness workshops and social engagement activities could be designed to enhance both physical and mental health. Future studies would contribute to the academic field and provide practical insights for creating targeted interventions that boost life satisfaction, ultimately promoting a healthier and more fulfilled older generation across various sectors.

Research Limitations

One of this study's main limitations is its reliance on secondary data obtained from the "Health Aging and Retirement in Thailand: Round 3" survey. While this dataset provides a rich source of information on the experiences of 3,156 elderly participants from both urban and rural settings in Thailand, it naturally constrains the scope of variables available for analysis. Specifically, the study faced limitations in exploring the breadth of the self-rated health concept, as the survey included only two questions related to this variable. This constraint is significant given the complexity of self-rated health as a construct and its critical role in mediating the relationship between mental health and life satisfaction among older adults. The limited number of questions on self-rated health limited our ability to deeply analyze and understand its various aspects and consequences. Future research could benefit from primary data collection focused on a broader set of questions regarding self-rated health, allowing for a more comprehensive exploration of its impact on the life satisfaction of older adults.

Conflict of Interest

The authors declare that there is no conflict of interest.

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