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A development of history instructional model on cloud technology to enhance critical thinking abilities and information literacy of undergraduate students

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Article Info

Abstract

Approaches to the teaching and learning of history in the 21st-century call for teachers' embracing changes due to the advent of advanced technologies, while critical thinking and information literacy are increasingly necessary for students' handling of overwhelming information. The purpose of this study was to develop, present, and assess the effectiveness of an instruction model which incorporates the use of cloud technology for teaching history at the university level in Thailand. Along with its learning management plan, this instructional model was validated by experienced teachers and triangulated with IT experts in the history subject before implementing it with a purposively sampled group of students in the Faculty of Education. A total of 189 undergraduate students were randomly selected for data collection. The findings were obtained from the analysis of the qualitative interview data and the quantitative information, which were then analyzed using the repeated measures ANOVA in the SPSS program. The results revealed the following: (1) this instructional model of teaching the history subject on cloud technology can enhance the critical thinking abilities and information literacy of undergraduate students in terms of rationales, objectives, methods, and conditions; (2) according to the data obtained from questionnaires, the instruction model was evaluated by 5 experts as having a high level of appropriateness (mean = 4.89, *SD* = 0.32); and (3) the result on an assessment of the quality of the learning management shows a statistically significant difference in the mean scores over four weeks at the 0.05 level of significance ($p > .05$).

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Introduction

As part of social studies, the teaching and learning of history at the university level requires that students learn historical methods so that they learn history in a systematic way. In this regard, critical thinking and evaluation abilities of the historical accounts on the part of the

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students are essential learning processes that are apparently related to the historical methods of learning history. These abilities are necessary, especially when students explore the historical information obtained from various sources, primary and secondary ones. This is because they need to approach them with a critical mind, involving sorting, criticizing, analyzing, and evaluating the materials prior to coming to the conclusion.

In this digital era, technology is advancing so rapidly that educators find it interesting to maximize its use in instruction. Cloud technology, which refers to the delivery of online resources made available on demand, is an advanced technology used widely by various sectors, from governments to education (Islam et al., 2017; Kurelović et al., 2013; Meesuwan, 2014). This is because such technology can facilitate learning from anywhere and anytime through the integrated learning processes designed on online platforms by the teachers aiming to stimulate students' critical thinking and information literacy. In terms of teaching and learning history, rather than using content-based lecturing, which is viewed by students as uninspiring and overwhelming, cloud technology allows teachers and students to bring in substantial information from various sources within reach. Nevertheless, the use of cloud technology specifically designed to manage history learning is still scarce in history instruction in the current Thai context. Therefore, it is necessary to investigate the use of technology in history instruction in the Thai context concerning its potential to facilitate students' critical learning content knowledge with information literacy. This management of history instruction through cloud technology is also in line with the current Thai government's 12th National Development Plan with its emphasis on human resource development and social equality.

Aims of the Study

1. To develop a history instructional model on cloud technology to enhance the critical thinking abilities and information literacy of undergraduate students.

2. To present and assess the effectiveness of the history instructional model on cloud technology to enhance the critical thinking abilities and information literacy of undergraduate students.

Research Questions

The study sought to answer the following research questions:

1. What was the outcome of the history instructional model as developed by the researcher on cloud technology to enhance the critical thinking abilities and information literacy of undergraduate students?

2. To what extent could the history instructional model developed by the researcher on cloud technology enhance the critical thinking abilities and information literacy of undergraduate students?

3. To what extent could the history instructional model developed by the researcher on cloud technology appropriate in enhancing the critical thinking abilities and information literacy of undergraduate students?

Literature Review

Development of the History Instruction Model

The instructional model using technology consists of the following four main components, according to Dick and Carey (2012) and Khamanee (2011): the teaching goals, the roles of the learners and teachers, the activities and tools, and finally, the evaluation. While the model encompasses philosophies, theories, principles and concepts of the instruction, the learners' and instructors' roles involve the form of interactive community and the facilitative system that is consistent with the goals. Meanwhile, the teaching activities and cloud tools are designed to implement the model, ending with the evaluation phase of effects that occur to the learners. The instruction model for the history subject using cloud technology is subsequently developed based on historical methods. Arts and culture (2020) and Nitikhetpricha (2016) suggest the following steps of history instruction model development that incorporate historical methods: (1) identifying topics considering problems, needs, and rationales; (2) gathering relevant content information from primary and secondary historical accounts including both written and non-written artefacts; (3) analyzing the credibility of primary and secondary evidence for data collection; (4) interpreting the data based on accuracy, trustworthiness, and integrity; and (5) summarizing and presenting the obtained data or information to explain the problems in the study.

Nevertheless, previous studies such as Colby (2007) and Pana (2017) have revealed the efficacy of instructional models developed by integrating technology for the teaching of other subjects. While history is a specific important subject in the curriculum, the investigation in this subject is still limited.

The Use of Cloud Technology in Education

The implementation of cloud technology in the development of the instruction model as mentioned in, Islam et al. (2017); Kurelović et al. (2013); and Meesuwan (2014) refers to the use of software as a service platform, such as Gmail, Google Docs and websites. The model development, therefore, begins with preparing relevant materials, including documents and PowerPoint slides for presenting and publishing the online lessons on websites and mobile applications as communication channels or platforms of learning.

Nevertheless, previous studies such as Ercan (2010); Goyal and Goyal (2016); and Kurelović et al. (2013) found the great benefits of cloud computing in business and education. In education, cloud computing is used in numerous scenarios including the development of the library system, the support system for students' professional experience training, the information channels for teaching and learning, and those online applications on which students create workpieces and submit their assignments in the ecosystem that are convenient, fast, and easily accessible.

Critical Thinking Abilities

Based on Angelo (1995), Lunenburg and Omstein (1996), and Yeh (2009) the characteristics of critical thinking ability used in this study involve students' abilities to (1) identify problems by exploring relevant questions in each situation and formulating assumptions based on appropriate reasons; (2) interpret the information obtained by considering historical methods and principles to emphasize the relationship of the acquired data providing that different perspectives are present; (3) to analyze, diagnose, and classify the obtained information by considering related conditions in each scenario; (4) to use inductive-deductive reasoning in order to make inference for logical summarization and conclusions from available evidence in solving the problems effectively; and finally (5) to assess the information by judging its value using criteria for determining its relevance and importance.

Critical thinking abilities improvement was also found through the use of various theoretical and practical online processes among the sample group of primary, secondary and university students, according to several studies in the review of previous studies such as, Brooke (2006); Cicchino (2015) and Khosravani et al. (2004). Compared to traditional model approaches such as the Zippa model, the five-step model technique, the problem-based approach, the cloud-based approach to instruction can enhance critical thinking abilities in various ways, including virtual field trips, online forums, and case studies embedded in online teaching and learning management. They are characterized by the reversed classroom layout, hybrid discussion activities, and online educational games, which can be classified as intellectual mapping, interpolation and interrogative models. Therefore, teaching history using cloud technology is an interesting model worth investigating to see whether such can enhance critical thinking abilities in undergraduate students.

Information Literacy

Common attributes that belong to people with information literacy exist in literature, including the American Library Association (2000), (Council of Australia University Librarian [CAUL] ,2001) and Narkkong (2010). These attributes refer to the following characteristics: (1) recognizing the needs and defining the scope of information required; (2) identifying and accessing information sources ethically and legally; (3) collecting and evaluating information for application; (4) applying the critical thinking ability, i.e., analyzing or synthesizing information; and (5) using the information to solve problems or find answers for the questions.

In this regard, previous studies such as Hanbidge et al. (2015); Kongrugsa et al. (2016); Michalak and Rysavy (2016); and Thaiposri and Wannapiroon (2015) presented the teaching of history as a model to develop critical thinking. Some studies have attempted to link critical thinking abilities with historical methods through various perspectives. This is because critical thinking can be applied to history learning in various ways depending on the content and context of teaching and learning through the promotion of thought processes by the teachers. Designing instructional management or learning plans in future research could focus on enhancing critical thinking and the development of cloud technology simultaneously. Cloud technology helps teaching and learning become more effective as it can classify learners into different groups, allowing students to get instant feedback and learn with others as part of an online community. This learning process can empower learners with 21st century skills, among which critical thinking abilities and information literacy are deemed necessary in connecting knowledge of the past and the present more effectively.

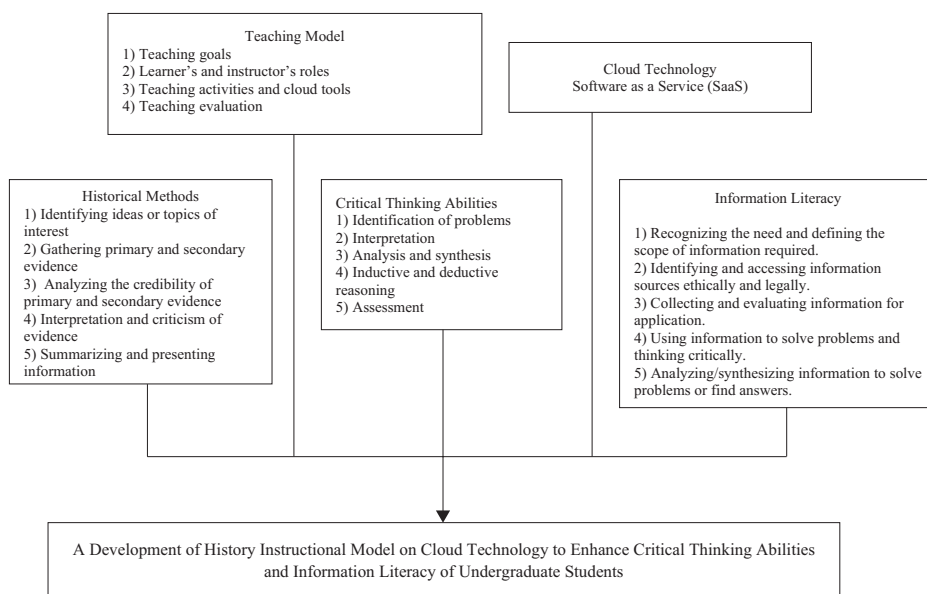This research has a conceptual framework as shown in the below Figure 1.

Conceptual Framework

Figure 1 The conceptual framework

Methodology

Design

Three major phases involved in the development of the learning management plan and related instruments of the study were as follows: (1) the development of the history instructional model on cloud technology; (2) the development of the learning management plan with four learning evaluation instruments; and (3) the try-out phase of the instruction model and the instruments.

Phase 1: The development of a history instructional model on cloud technology

Aiming to enhance undergraduate students' critical thinking abilities and information literacy, the researcher started the instruction model development by investigating the concept, theories, and research related to history instructions that pertain to the enhancement of critical thinking abilities and information literacy. Then, a five-Likert scale questionnaire with 38 items was constructed and distributed to 524 randomly selected voluntary undergraduate students from the Faculty of Education to investigate their current needs and situations regarding the history instruction model. The researcher, then, used the data to design a draft of a history instructional model on cloud technology.

Phase 2: The development of the learning management plan with four learning evaluation instruments

After that, a focus group interview of 13 experienced history teachers as experts in the field was carried out by the researcher in order to seek opinions on how to develop the history instruction model on cloud technology to enhance the critical thinking abilities and information literacy of undergraduate students. Based on the preliminary data from both students and expert teachers in phase 1, the history instruction model on cloud technology to enhance critical thinking abilities and information literacy of undergraduate students was developed, and then validated by five authorities in the fields of history instruction and technology using IOC (Index of Items-Objective Congruence) for a questionnaire consisting of 16 items with five-Likert scale questions.

Phase 3: The try-out phase of the learning management plan and the research instruments constructed in Phase 2

In this phase, the researcher constructed the learning management plan that corresponded with the instruction model in phase 2. It consists of four learning evaluation instruments, namely: (1) the performance-based critical thinking abilities assessment form (with three-scale rubric assessing 10-criterion items); (2) an information literacy evaluation form (with three-scale rubric assessing 10-criterion items); (3) the behavior observation form for the

researcher to take note of the participants' critical thinking abilities and information literacy (with 6 check-list items of behaviors using a three-scale rubric of assessment); and (4) a survey of participants' opinion after 4 weeks studying history on cloud technology using the instruction model to enhance critical thinking abilities and information literacy. The survey consisted of five-Likert scale 18 items of questions assessing nine areas of these two aspects.

In this try-out phase, the learning management plan and the research instruments developed in phase 2 were re-assessed in terms of appropriateness by three experts in the field of history teaching, followed by the re-adjustment of the plan according to the experts' opinions. Then, the plan and the instruments were administered to 20 undergraduate students at the Faculty of Education, who were not the sampled participants, but were deemed to be representative of the population for which the final plan and instruments were intended. The try-out was run with confidentiality regarding the participants' identity. Then, the researcher analyzed the data obtained in the try-out phase and improved all of the research instruments accordingly. The sample was 189 undergraduate students randomly selected from the Faculty of Education, Chulalongkorn University.

After the research analysis is accomplished, the data related to the sample will be destroyed.

Research Procedures

The research procedure followed three phases, including: (1) the data collection; (2) the data analysis; and (3) the setup of the history instructional model on cloud technology. The learning management plan and other instruments were used to collect data from 189 purposive sampled students as research participants from the Faculty of Education, whose identity was also concealed and whose data were completely destroyed after the research completion. Then, the data obtained were analyzed based on the stated criteria. The quantitative analysis of the data obtained from the questionnaire included mean scores, percentages, and standard deviation. In addition, the quality of the tools was analyzed using repeated measures ANOVA to compare data on critical thinking abilities and information literacy using the SPSS program.

Data Analyzes

There were three phases of data analysis: In phase 1, the researcher conducted the data analysis of the questionnaire. The quantitative data were obtained in the forms of number, percentage, mean and standard deviation with the participants' information (see Table 1).

The findings reveal that the participants anticipate better conditions for the teaching of history after implementing cloud technology in the teaching of history.

In phase 2, the data from the group discussion by five qualified persons were synthesized with the following results (see Table 2).

After being examined by five qualified persons, the history instruction model on cloud technology was rated at the highest level of appropriateness in the teaching of history.

In phase 3, the quantitative analysis was conducted using descriptive statistics of mean and standard deviation to assess critical thinking abilities. Then, the data obtained in Table 4 regarding critical thinking abilities and information literacy were analyzed using the Repeated Measures ANOVA statistical analysis with the SPSS program. The results are shown in Table 3.

Table 1 The opinions of participants regarding conditions and needs of the teaching of history on cloud technology

Assessment item	Current condition		Preferable condition	
	M	*SD*	*M*	*SD*
1. Objectives of teaching and learning	3.54	0.89	4.27	0.74
2. The role of learners and teachers	3.64	0.83	4.32	0.73
3. Teaching and learning activities and the use of teaching materials	3.66	0.84	4.33	0.73

Table 2 The appropriateness of the history instruction model on cloud technology

Assessment item	*M*	*SD*
1. Overview of the development of historical teaching	4.90	0.31
2. Elements of historical teaching	4.88	0.33
3. Procedures for teaching and learning activities	4.89	0.32
Phase 1 Introduction to the lesson	5.00	0.00
Phase 2 Learning activities	4.92	0.28
Phase 3 Conclusion	4.83	0.38

Table 3 The analysis was statistically different among the four instruments of research

Instruments	principle	Sum of Squares	df	Mean Square	F	p
1. The performance/work assessment form for assessing critical thinking abilities	Sphericity Assumed	71.189	3	23.730	6.812	< .001
2. The performance/work assessment form for assessing information literacy	Greenhouse-Geisser	270.120	2.705	99.842	6.316	< .001
3. A behavioral observation form to assess critical thinking abilities and information literacy	Greenhouse-Geisser	175.201	2.776	63.111	10.023	< .001
4. A Cloud technology opinion assessment form	Greenhouse-Geisser	5.072	2.861	1.773	4.664	.004

Table 4 Data obtained from four evaluation instruments collected over a four-week period

| Evaluation tools	Week 1		Week 2		Week 3		Week 4	
	M	SD	M	SD	M	SD	M	SD
1. The performance/work assessment form for assessing critical thinking abilities	13.38	2.14	13.62	1.68	13.96	1.91	14.18	1.74
2. The performance/work assessment form for assessing information literacy	26.01	4.91	27.06	4.34	27.25	3.63	27.62	3.04
3. A behavioral observation form to assess critical thinking abilities and information literacy	15.59	2.69	16.13	2.52	16.41	2.39	16.92	1.88
4. A Cloud technology opinion assessment form	4.38	0.66	4.49	0.65	4.51	0.56	4.61	0.56

Results

Based on the aforementioned three research questions, the following findings were reached:

1. The history instruction model on cloud technology to enhance critical thinking abilities and information literacy of undergraduate students consisted of rationales, objectives, methods, and conditions of how to apply the model for teaching history on cloud technology. Figure 2. depicts the model framework stated earlier.

2. The results of the assessment of the history teaching model on cloud technology to enhance the critical thinking abilities and information literacy of undergraduate students were assessed by five qualified persons after their evaluation for certification of the appropriateness of the form at the highest level (mean = 4.89, SD = 0.32).

3. As for the effects of using the history teaching model on cloud technology to enhance critical thinking abilities and information literacy of undergraduate students after the researcher's implementation of the
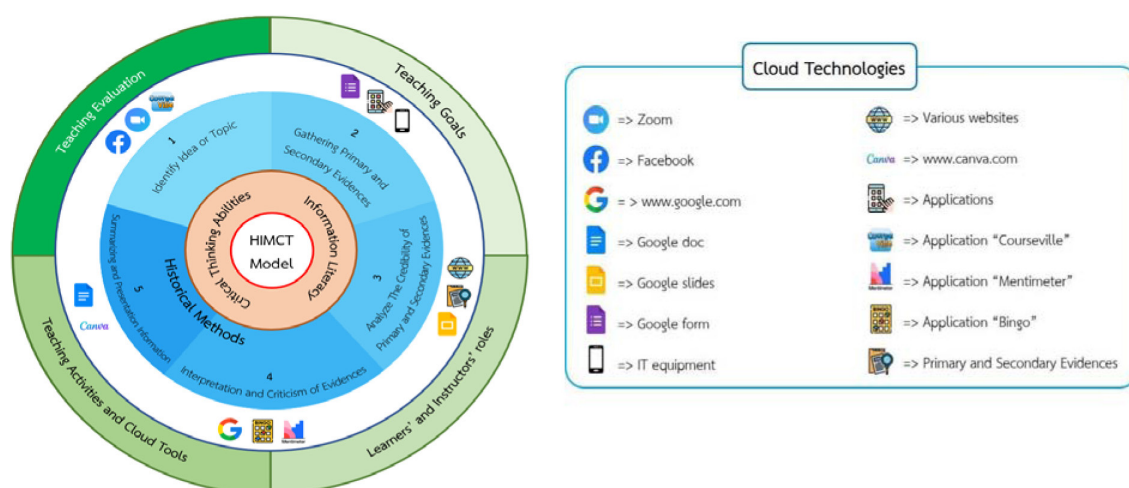
Figure 2 History instructional model on cloud technology to enhance critical thinking abilities and information literacy of undergraduate students

learning management plan for a period of four weeks, the data obtained from four measurement and evaluation tools in chronological order are presented in Table 4 below:

The Repeated Measures ANOVA was used to analyze the data and compare critical thinking abilities and information literacy using the SPSS program. The findings revealed that the mean scores of critical thinking abilities and information literacy each week were significantly different at the .05 level of significance in the mean scores of both aspects. The scores were higher each week (see Table 5 – 6).

Table 5 Weekly mean score illustrating critical thinking abilities

Week	1	2	3	4
1	-	-.243	-.582*	-.799
2	.243	-	-.339	-.556*
3	.582*	.339	-	-.217
4	.799*	.556*	.217	-

*Note: * $p < .05$.*

Table 6 Weekly mean scores illustrating information literacy

week	1	2	3	4
1	-	-1.048*	-1.243*	-1.608*
2	1.048*	-	-.196	-.561
3	1.243*	.196	-	-.365
4	1.608*	.561	.365	-

*Note: * $p < .05$.*

Discussions

To achieve the aims of the research, the History Instructional Model on Cloud Technology (HIMCT Model) had been developed to enhance the critical thinking abilities and information literacy of undergraduate students; the model was professionally assessed by a team of qualified persons. Additionally, the HIMCT Model was found to be advantageous in increasing the critical thinking abilities and information literacy of the research participants with statistical differences each week.

The findings suggests that the HIMCT Model was found to be favorable among the research participants both in terms of the learning outcome and the appropriateness in enhancing critical thinking abilities and information literacy. These findings are consistent with what was found in the studies by Dhabalakchana (2017); Khlaisang and Mingsiritham (2016); and Rattanawonsa (2016), who developed different instructional models with the help of technology, leading to students' higher scores development in various

academic skills at the .05 level. In terms of students' attitudes resulting from learning through web-based instruction, the high level of appropriateness of this study is found to be in line with Leight (2004), who studied the effect of the use of web-based instruction in the Physical Education and related Departments in the Pennsylvania State System of Higher Education. Akhmetshin et al. (2021) also confirmed that the students had a positive attitude towards digital educational technologies and MOOCs. This is because the learning materials were easy to retrieve, visual and diverse, causing the cognitive thinking abilities of students to grow, with the improvement of the quality of information transmission and knowledge transfer. Google Applications including Google Docs, Google Form, and Google Sites and other online applications are convenient tools which can serve as platforms for sharing, updating, discussing and collaborating at anytime and anywhere.

Cloud technology is, therefore, not only an emerging technology but also plays a vital role in teaching and learning history through historical methods. Elaborated in studies conducted by Ampera (2017); Bamong (2021); and Makruf et al. (2021), cloud technology can be well adapted to a history classroom. The integration of cloud technology with historical methods increases the accessibility to the virtual reality of the primary historical resource; moreover, it allows students to comprehend the concepts of history accurately. The implementation of cloud technology in history teaching accordingly enhances the critical thinking abilities of students.

With regard to the score improvement of critical thinking abilities and information literacy after using the history instructional model on cloud technology, the significantly higher scores of both categories found in this study were consistent with the studies by Saiyasit (2018); Sama et al. (2022); Supaluk (2018); and Yeamprayunsaward (2017), in which the mean scores of the instructional model on cloud technology were higher from pre-test to post-test at the .05 significance level. Additionally, the findings of this study are also in agreement with the findings of Ditsiri et al. (2021), who found that participants in blended learning scenarios developed both the proactive learning skill and competence in information technology, as well as communication among learners.

Based on the connectivism theory, Meenui (2021) claimed that it is possible for mobile-based learning to promote computational learning skills, including content memorization and an increase in long-term memory for seventh-grade students. Volkova et al. (2020) found interaction with virtual reality can fix the status of a passive consumer to the individual whose consciousness

as a correlate of an information system represents an ideal object for all kinds of manipulations or initiate the birth of a creative person with a spiritual identity which is acquired in the unity of information and conceptual systems. Not surprisingly, virtual reality has become an integral component of the global Internet. In conclusion, implementing cloud technology as an immersive tool in classrooms benefits history studying by creating an active learning environment, bringing excitement and engagement to the classroom, and developing understanding of a complex subject.

The enhancement of critical thinking abilities was due to several factors including the connection between knowledge and critical thinking made possible with the historical methods and the students' collaboration on cloud technology, causing the average scores of critical thinking abilities to be higher (Kongrugsa et al., 2016; Thaiposri & Wannapiroon, 2015). Among these factors, creativity was found to be essential in the form of thoughts, including critical thinking for making decisions. The Department of Education, Employment and Workplace Relations (2009) highlights that creativity comes from two types of thinking processes. The first is divergent thinking, which requires imagination, intuition, and intention. The second one is convergent thinking, which is one-way thinking and is a narrow problem-solving process with very limited alternatives. Through convergent thinking, the best possible solution can be obtained from the environment of the problem. Then, it comes to the idea implementation process, where the primary ideas will be implemented or exploited. The created ideas will enable the thinkers to create innovations and implementation for the common goals. Another factor is that learners were found to have entered the learning process through investigation. Ahmed and Parsons (2013) conducted a study on abductive science inquiry using mobile devices in the classroom and found that the use of technological tools in an application called ThinknLearn, not only helps learners gain convenient access to learning resources, but also encourages learners to engage in the investigation process. Moreover, the critical thinking process can be applied to good learning management.

In terms of the significant increase the students' scores on information literacy over the four-week period, the following studies, including Kultawanich (2014); Rodrigo and Platon (2022); and Yeamprayunsaward (2017), found that students' preference of online learning and the capability of the instruction to create their problem-solving skill were among the factors that can explain the findings. While Kultawanich (2014); and Yeamprayunsaward (2017), found that the sample's mean score on information literacy was higher when students support the use of technology in the assessment of information literacy, the study of Koraneekij and Khlaisang (2019) encourages the use of e-portfolios in higher education students as it enabled them to solve learning problems according to their needs both independently, with peers, and with instructors' guidance. In other words, this method of learning can develop learners' problem-solving skills.

Conclusion

The History Instructional Model on Cloud Technology (HIMCT Model) was created for teaching history in order to enhance undergraduate students' critical thinking abilities and information literacy. The mean scores of critical thinking abilities and information literacy over 4 weeks were significantly different at 0.05 level, and the mean scores on both sides were higher each week. Based on the teaching principles and theories, the model of instruction and the instruments used to assess the efficacy and appropriateness of the instruction were verified prior to actual implementation. Then, the researcher created a learning management plan that was consistent with the aforementioned model and used it for a period of four weeks.

Suggestions

Suggestions for Executives

To lay education policy and to develop the curriculum for social studies, religions, and culture, specifically history studies both for the basic compulsory education level throughout Thailand and for the Faculty of Education, Chulalongkorn University

Suggestions for Education Supervisors

To create an instructional model integrating cloud technology into history teaching to enhance critical thinking abilities and information literacy for each educational service area.

Suggestions for Further Studies

1. To build on history teaching and other disciplines such as social sciences, religions, and cultures to increase critical thinking abilities and information literacy for undergraduate students.

2. To provide the idea of implementing cloud technology to teachers who want to create an instructional model of history teaching to strengthen critical thinking abilities and information literacy in general or specifically in each discipline.

Conflict of Interest

The author declares that there is no conflict of interest.

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