Project-Based Learning Management in Collaboration with Local Enterprises to Enhance Students' Entrepreneurial Skills

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Article Info
Received 2 April 2026
Revised 26 April 2026
Accepted 27 April 2026
Available online 28 April 2026

Abstract

The objectives of this research were 1) to develop a project-based learning management model in collaboration with local enterprises to enhance students' entrepreneurial skills; 2) to assess students' entrepreneurial skills; and 3) to evaluate the satisfaction of local business establishments toward the developed learning model. The sample consisted of 80 undergraduate students enrolled in the Digital Business Entrepreneurship course and entrepreneurs from the Agarwood Community Enterprise in Ubon Ratchathani Province. The research instruments included the learning management model, an entrepreneurial skills assessment form, and a satisfaction questionnaire. Data were analyzed using mean, standard deviation, and paired samples t-test. The research findings revealed that

1. The developed learning management model consists of six stages, known as the P-P-I-D-P-E Model.

2. Students' entrepreneurial skills after the implementation ($\bar{X}$ = 41.59) were significantly higher than the pre-test scores ($\bar{X}$ = 18.44) at a .05 level of statistical significance. The Cohen's d effect size was 5.22, indicating an exceptionally large effect size. Specifically, the communication and collaboration dimension yielded the highest mean score ($\bar{X}$ = 4.76).

3. The local business establishments' satisfaction toward the learning management model was at the highest level ($\bar{X}$ = 4.59), confirming that the model effectively bridges the gap between academic theory and real-world community practice. Keywords: Project-Based Learning, Entrepreneurial Skills, Local Enterprises.

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Introduction

The rapid changes in 21st-century society and economy require educational systems to adapt learning management to the modern global context by developing learners' key skills such as analytical thinking, problem-solving, collaboration, and innovation (Trilling & Fadel, 2009; Chakkrakrit, 2025; Mala et al. & Chakkrakrit, 2024), along with entrepreneurial skills. These enable students to adapt to economic and social changes and create future career opportunities (Hisrich, Peters, & Shepherd, 2017). Project-based learning (PBL) promotes active learning through real hands-on practice, systematic thinking, analysis, and problem-solving (Thomas, 2000; Condliffe et al., 2017). However, many institutions still focus on knowledge transmission, limiting students' exposure to authentic situations. Connecting learning with local enterprises allows students to experience real work contexts, study actual business problems and needs, and develop entrepreneurial competencies like planning,

decision-making, and problem-solving, consistent with experiential learning (Kuratko, 2016). Research also supports that PBL effectively enhances analytical thinking, problem-solving, and collaboration skills (Nuaiplot, 2021; Kitcharoenrueng et al., 2022). Therefore, the researcher developed a project-based learning model in collaboration with local enterprises to strengthen students' entrepreneurial skills in line with current socio-economic contexts. This model can serve as a guideline for educational institutions and promote university-local business partnerships to enhance learners' potential for future careers or entrepreneurship.

In Ubon Ratchathani Province, traditional entrepreneurship courses emphasize theory and simulations, leaving students without real-world experience and unable to apply digital technology to develop local businesses upon graduation. Integrating the Agarwood Community Enterprise Group into project-based learning makes this model superior to conventional PBL in three key aspects: 1) replacing hypothetical problems with real business challenges, enabling students to solve actual issues and design digital businesses for genuine community products; 2) learning directly from real entrepreneurs through guidance and firsthand experience; and 3) upgrading local resources by training students to use digital technology to add value to agarwood, the province's valuable heritage. The involvement of local enterprises not only equips students with practical entrepreneurial skills but also creates innovations that address community economic needs. Thus, developing this project-based learning model with local enterprises is not merely an improvement in teaching methods but the creation of a learning ecosystem that links higher education institutions with the community. It cultivates students with ready-to-use entrepreneurial skills, enabling them to become a driving force in advancing the economy of Ubon Ratchathani Province.

Objectives

1. To develop a project-based learning model in collaboration with local enterprises that enhances students' entrepreneurial skills.
2. To evaluate students' entrepreneurial skills after implementing the developed model.
3. To assess local enterprises' satisfaction with the learning management model.

Outcomes and Benefits

This study is expected to yield the following benefits: 1) The development of a project-based learning model in collaboration with local enterprises. 2) Clear development in students' entrepreneurial skills, particularly in business thinking processes, resource management planning, and hands-on practice in real situations. 3) Local enterprises will receive new ideas and prototype innovations from students' projects that help solve business problems, add value to products or services, and can be further developed for commercial application.

Theoretical Framework, Hypotheses, and Conceptual Framework

1. Research Hypotheses

1.1) Students participating in the project-based learning management model collaborated with local enterprises will demonstrate entrepreneurial skills at a very high level after the implementation.

1.2) Local business establishments show very high satisfaction toward the developed learning management model.

2. Conceptual Framework

In this research titled Development of a Project-Based Learning Management Model Collaborated with Local Enterprises to Enhance Students' Entrepreneurial Skills, the researcher has determined the operational scope based on the conceptual framework as follows:

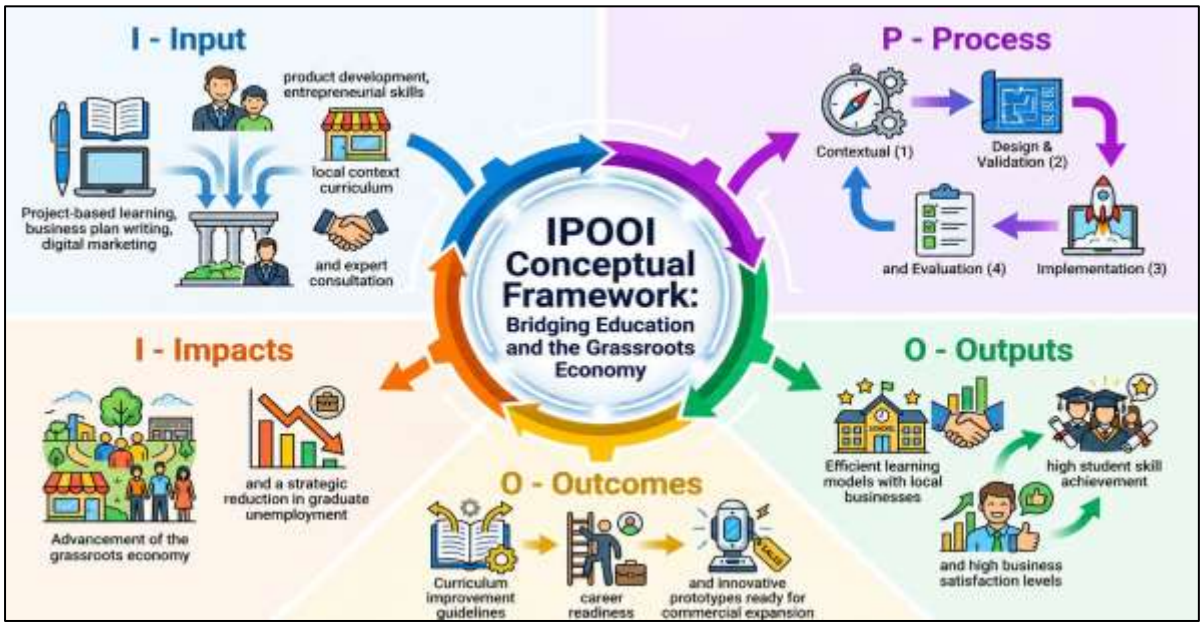


Figure 1: Conceptual Framework

From Figure 1, The conceptual framework for conducting the research followed the IPOOI steps as follows:

1. Input Factors consist of 1) Project-based learning process 2) Business plan writing principles 3) Digital marketing 4) Product development 5) Product development 6) Entrepreneurial skill 7) Local Enterprise Context Curriculum Content 8) Project-Based Learning 9) Expert Consultation

2. Process Phase 1: Contextual, Phase 2: Model Design & Validation Phase 3: Model Implementation Phase 4: Evaluation

3. Outputs The outputs resulting from this research consist of 1) An efficient project-based learning management model developed in collaboration with local business establishments. 2) Learners' development, with students achieving entrepreneurial skills scores at a very high level after the learning process. 3) The evaluation of local business establishments' satisfaction with the learning management model at a very high level

4. Outcomes The research serves as a guideline for curriculum improvement, enabling students to apply the acquired skills to pursue freelance careers or become entrepreneurs upon graduation. Furthermore, local business establishments gain innovative approaches or prototype products that can be commercially expanded to enhance sales performance.

5. Impacts The study promotes the advancement of the community's grassroots economy and provides a strategic approach to reducing graduate unemployment by ensuring that graduates possess the specific skills required by business establishments.

Literature Review

Concepts and Theories on Project-Based Learning

Project-Based Learning is a learner-centered instructional approach that provides opportunities for students to learn through hands-on practice, research, questioning, and systematic problem-solving to construct their own knowledge while working collaboratively in groups (Thomas, 2000; Bilgin, I., et al., 2015; Yoon, S. Y., et al., 2018). This concept aligns with

Constructivism theory, which views learning as occurring through learners' interactions with experiences and their surrounding environment, enabling them to develop key 21st-century skills such as analytical thinking, problem-solving, communication, and collaboration. It also helps learners connect theoretical knowledge to real-life situations, resulting in meaningful learning that can be appropriately applied (Condliffe et al., 2017; Moolkam et al., 2019). In project-based learning, teachers act as facilitators and advisors, supporting and guiding the learning process, while students play a central role in selecting project topics, planning implementation, and executing their own work. This promotes responsibility for learning and develops self-directed learning skills. Furthermore, assessment in project-based learning should focus on authentic evaluation, assessing both the process and outcomes of learning for example, through observing work behaviors, monitoring project progress, and presenting student work (Kitisak Srisamut and Pinantra Chatwatana, 2021; Kanyarat Nityawan, 2019). Based on these concepts, the researcher adopts the principles of project-based learning as the conceptual framework for designing the learning process in this study.

Concepts and Theories on Business Plan Writing

Business plan writing is a systematic process of planning business operations, aimed at defining concepts, goals, and approaches across various aspects such as marketing, management, and finance. It serves as a framework for establishing strategies and directions to achieve set objectives. A business plan is a crucial tool that enables entrepreneurs to analyze the business environment, assess venture feasibility, and plan operations effectively (Somkid Bangmo, 2019; Aphasilp, 2020; Serirat et al., 2017; Jaturongkakul, 2018). In recent times, the Business Model Canvas framework has become popular for business planning. It comprises nine key components: Customer Segments, Value Propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, and Cost Structure. This helps entrepreneurs gain a systematic overview of the business model and the interconnections among various activities (Osterwalder & Pigneur, 2010). Business plan writing plays a vital role in analyzing business opportunities and risks, supporting strategic decision-making, and serving as an effective tool for communicating business ideas to investors or relevant agencies (Suphap, 2020). The researcher applies these concepts as a framework for designing learning activities and as an integral part of the project-based learning process to systematically promote learners' entrepreneurial skills.

Concepts and Theories on Marketing Fundamentals

Marketing is a management process focused on analyzing consumer needs, developing products and services, and delivering value to customers to create satisfaction and long-term relationships between the business and consumers (Siriwan Serirat et al., 2017). Marketing activities involve planning, pricing, sales promotion, and distribution of goods and services to effectively meet market needs (Aduly Jaturongkakul, 2018). A key concept in marketing activities is the Marketing Mix (4Ps): Product, Price, Place (distribution channels), and Promotion. These serve as essential tools for formulating business strategies (Somkid Bangmo, 2019). Additionally, marketing concepts are linked to business idea development and business plan preparation. They can be integrated with the Business Model Canvas framework to analyze key business components, such as customer segments, value propositions, and channels (Osterwalder & Pigneur, 2010). Integrating these concepts with project-based learning allows learners to engage in real hands-on practice from market analysis and business idea design to marketing planning and result presentation-thereby promoting entrepreneurial skills such as business thinking, planning, and collaboration (Wongmontha, 2020; Suphap, 2020).

Concepts and Theories on Digital Marketing

Digital marketing involves conducting marketing activities through digital technologies and online media to communicate information about products and services to target customers. Its goals include building awareness, stimulating interest, and encouraging purchase decisions

(Chaffey & Ellis-Chadwick, 2019). Digital marketing enables businesses to reach customers quickly, overcome time and location constraints, analyze consumer behavior, and measure marketing activity outcomes effectively (Ryan, 2017; Siriwan Serirat et al., 2017). In the context of developing entrepreneurial skills, integrating digital marketing concepts with project-based learning-connected to local enterprises-allows learners to gain real-world experience from market analysis, strategy planning, testing marketing activities, to evaluating results from actual data. This process significantly contributes to developing learners' entrepreneurial skills in business thinking, digital skills, and collaboration, aligning with the digital economy context and sustainable local development (Kotler et al., 2017).

Concepts and Theories on Product Development

Product development is a critical process for creating goods and services that meet consumer needs and provide competitive advantages in business. A product refers to anything offered to the market for use or consumption, which may take the form of goods, services, or the value received by consumers (Siriwan Serirat et al., 2017; Aduly Jaturongkakul, 2018). The general product development process includes key stages: idea generation, idea screening, concept development and testing, prototype development, and market testing before commercial launch. This reduces risks and increases the chances of product success in the market (Kotler & Armstrong, 2016; Crawford, 2020). In an educational context, these concepts can be integrated with project-based learning to enable learners to experience real product development- from business idea generation and prototype design to business feasibility analysis. This promotes entrepreneurial skills, creativity, and problem-solving-essential competencies for 21st-century learners.

Concepts and Theories on Entrepreneurial Skills

Entrepreneurial skills refer to an individual's ability to initiate, innovate, and manage a business effectively and efficiently. These encompass key skills such as identifying business opportunities, planning, decision-making, resource management, and risk managementcore competencies that enable businesses to operate and compete in a rapidly changing economic environment (Natthaphon Yai Phirojn, 2018; Somkid Bangmo, 2019). Entrepreneurs play a vital role in creating innovation, developing products, and driving societal economic growth (Kuratko, 2016; Barringer & Ireland, 2019; Hassan, A., et al., 2019). They can apply resources and knowledge to create economic value and expand business opportunities (Hisrich, Peters, & Shepherd, 2017). In an educational context, these concepts can be integrated with project-based learning (Project-Based Learning) to help learners develop business thinking, innovation creation, and real-situation problem-solving skills, which are crucial for enhancing entrepreneurial competencies (Kozlinska, I., et al., 2020).

Research Methodology

Research Participants and Samples

The participants and samples for this research consist of four main groups as follows: Group 1: 80 undergraduate students from Ubon Ratchathani Rajabhat University enrolled in the Digital Entrepreneurship course subject code 3603217 during the second semester of the 2025 academic year, Group 2: The Agarwood Community Enterprise Group in Ubon Ratchathani Province, which serves as the authentic learning site for students to conduct situational analysis and develop their projects, Group 3: Six experts interviewed to obtain foundational data and requirements for the development of the learning management model, Group 4: Three experts tasked with evaluating and validating the quality and efficiency of the developed learning model.

Research Design

In this study, the researcher employed a Quasi-Experimental Research design, specifically utilizing the One-Group Pretest-Posttest Design, as illustrated in the following table 1

Table 1: Research Design for A Comparative Study of University Students' Entrepreneurial Skills

Target Group	Pre-test	Treatment	Post-test
Sample Group (Students)	O1	X	O2

Definition of Symbols:

O1 refers to the Pre-test assessment of digital entrepreneurial skills before the intervention.

X refers to the Treatment, which is Project-Based Learning in collaboration with business enterprises based on the P-P-I-D-P-E Model.

O2 refers to the Post-test assessment of digital entrepreneurial skills after the intervention.

Research Instruments and Data Collection Procedures

This research conducted the data collection process following the One-Group Pretest-Posttest Design. The procedures were divided into three main phases as follows:

Phase 1: Preparation and Pre-testing

Before implementing the learning model, the researcher established baseline data through a pre-test. An entrepreneurial skill assessment consisting of 50 items, which had been validated for quality using the Index of Item-Objective Congruence (IOC). To evaluate the students' initial entrepreneurial skills prior to the intervention.

Phase 2: Learning Management (Intervention)

The researcher implemented the learning management model based on Project-Based Learning in collaboration with a local enterprise. The instruction was conducted over a total of 60 hours, utilizing five lesson plans as the primary instructional tools. These plans covered essential topics, including Business Plan Writing, Digital Marketing, and Product Development. The instructional process followed the six core steps of the learning model as follows:

1. Students engaged in hands-on activities at the Agarwood Community Enterprise in Ubon Ratchathani to gather real-world data for their business plan development.

2. Development and Refinement: Students refined their business plans and enhanced their prototypes or services. The instructor served as a mentor and facilitator, monitoring progress and providing guidance to resolve issues encountered during the process.

3. Presentation Students presented their finalized projects through a Final Pitch to demonstrate the business feasibility to both the instructor and the entrepreneur.

4. Evaluation The project outcomes and teamwork were collectively evaluated by the instructor and the community entrepreneur.

Phase 3: Post-intervention Evaluation

Upon completion of the 60-hour instructional period, students' entrepreneurial skill development was evaluated using the same assessment tool as the pre-test, while participating enterprises provided feedback on project outcomes and business feasibility to measure overall satisfaction.

Data Analysis

The data collected from various research instruments were analyzed in accordance with the research objectives as follows:

1. Quantitative Data Analysis

The Index of Item-Objective Congruence was analyzed based on expert evaluations to determine the content validity of the learning management plans and the entrepreneurial skill assessment tools.

1.1) To compare students' entrepreneurial skills, pre-test and post-test scores were analyzed using basic statistics, including Mean and Standard Deviation Furthermore, a t-test for Dependent Samples was employed to test the differences between pre-test and post-test scores and to determine if the learning management model significantly contributed to skill development at a statistically significant level.

1.2) Data from satisfaction surveys completed by both the participating enterprises and the students were analyzed using Mean and Standard Deviation. The resulting means were then interpreted according to the predefined satisfaction level criteria.

2. Qualitative Data Analysis

Content Analysis was performed on the data obtained from initial expert interviews to synthesize and identify the key components of the proposed learning model. Data from post-instructional logs, Final Pitch presentations, and in-depth feedback from the Agarwood Community Enterprise were analyzed through thematic grouping. The findings were then summarized using descriptive analysis to provide a profound explanation of student behavior and their developmental progress in depth.

Research Findings

Regarding the research on the Development of a Project-Based Learning Model in Collaboration with Local Enterprises to Enhance Students' Entrepreneurial Skills, the researcher has summarized the findings into three main parts, corresponding to the research objectives, as follows:

Part 1: Development of the Project-Based Learning Model in collaboration with Local Enterprises to Enhance Entrepreneurial Skills

This research has produced a project-based learning management model in collaboration with local enterprises to enhance students' entrepreneurial skills, as shown in Figure 2.

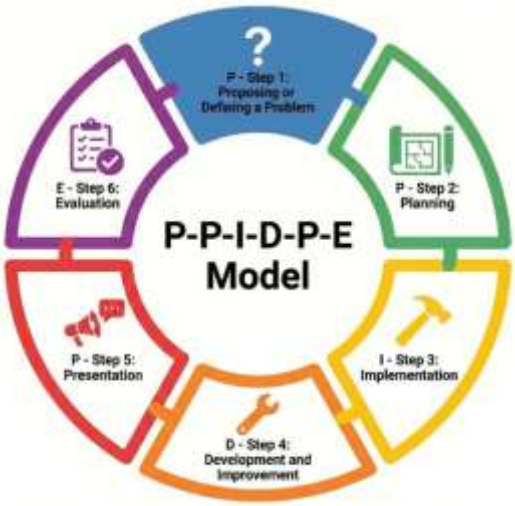


Figure 2: Project-Based Learning Management Model in Collaboration with Local Enterprises to Enhance Students' Entrepreneurial Skills

From Figure 2, the developed project-based learning management model in collaboration with local enterprises is a learner-centered model that emphasizes hands-on practice. It integrates cooperation among educational institutions, instructors, students, and entrepreneurs, enabling students to gain authentic experiences aligned with real business contexts and develop entrepreneurial skills effectively. The details of the model are as follows:

Stage 1: Problem Proposal or Definition Stage

1. Instructor: Acts as a learning facilitator by stimulating interest and analytical thinking through provocative questions and preparing relevant resources on entrepreneurship and community enterprises for further study.

2. Students: Play the main role in researching information, analyzing data, and exchanging ideas in class to identify problems or business opportunities from the community context.

3. Entrepreneurs: Serve as a real-world information source and contextual reference, helping students appropriately link problems and business opportunities to the community's economic and social environment.

Stage 2: Planning Stage

1. Students: Take the lead in data analysis and business concept design by creating a Business Model Canvas (BMC) covering all 9 components, along with designing product/service prototypes, product imagery, and brand concepts to form a feasible business model.

2. Instructor: Provides consultation, suggests analytical approaches, and offers recommendations to refine and strengthen the business plan.

3. Entrepreneurs: Supply contextual information on local markets, resources, or product trends, enabling students to design business concepts that are more aligned with real conditions.

Stage 3: Implementation Stage

1. Students: Engage in real-world practice by testing the business prototype in the community, collecting data through interviews or conversations with community enterprise members, and using the findings to analyze and improve their business plans.

2. Instructor: Supervises, advises, and monitors activity progress to ensure fieldwork is appropriate and maximally beneficial for learning.

3. Entrepreneurs: Provide information, suggestions, and feedback on students' business concepts, helping students gain deeper insight into actual business operations.

Stage 4: Development and Improvement Stage

1. Students: take the main role in analyzing and reviewing data obtained from real fieldwork or suggestions from community enterprise groups to identify weaknesses. They then revise the Business Model Canvas, further develop the product or service prototype to make it more complete, and summarize the acquired knowledge in preparation for the final presentation.

2. Instructor: acts as an advisor and facilitator by monitoring progress, providing advice on problem-solving, checking the quality of the improved work to ensure it meets the learning objectives, and supplementing necessary content (such as cost management or market research).

3. Entrepreneurs: serves as a mentor, providing in-depth information and reflecting real-world business experience. They jointly review the correctness and feasibility of the business ideas so that the products developed by learners truly meet market needs and align with the local resource context.

Stage 5: Presentation Stage

1. Students: Summarize all knowledge gained from the project, prepare project reports and presentation media, and deliver the business concept in a Final Pitch format, highlighting problems, business opportunities, product value, and real-world testing outcomes.

2. Instructor: Evaluates the presentation, offers feedback, and creates a realistic presentation atmosphere to enhance students' communication and presentation skills.

3. Entrepreneurs: Participate as listeners or provide additional suggestions, offering practical perspectives from real business experience.

Stage 6: Evaluation Stage

1. Instructor: Assesses learning outcomes across multiple elements project work, complete reports, presentations, and team behavior to reflect students' development in knowledge, skills, and entrepreneurial characteristics.

2. Students: Conduct self-assessment and reflect on their learning to improve critical thinking, analysis, and future business concept refinement.

3. Entrepreneurs: May offer opinions on the feasibility of business concepts, adding practical insights for students.

This learning management process clearly demonstrates the interconnected roles of the three parties: students actively construct knowledge through hands-on work, instructors serve as facilitators and academic advisors, and community entrepreneurs act as real-world experience providers and information sources. The collaboration among these three parties is the key mechanism that ensures meaningful learning fully aligned with actual business contexts.

Part 2 : Results of the Students' Entrepreneurial Skills Assessment This part evaluates the development of students' skills

Table 2: Comparison of Students' Entrepreneurial Skills Scores Before and After the Implementation (n=80)

Assessment	Mean	S.D.	DF	T	P	MD	Cohen's d
Pre-test	18.44	4.89	79	46.73*	.000	23.15	5.22
Post-test	41.59	5.02					

Table 2 illustrates that the students' entrepreneurial skills scores after the implementation ($\bar{X}$ = 41.59, S.D. = 5.02) were significantly higher than the pre-test scores ($\bar{X}$ = 18.44, S.D. = 4.89) at the .05 level, with a mean difference (MD) of 23.15. Furthermore, the analysis revealed a Cohen's value of 5.22, indicating a very large effect size. This suggests that the developed P-P-I-D-P-E learning management model had a substantial practical impact on enhancing the students' entrepreneurial skills.

Table 3: Results of the Evaluation of Entrepreneurial Skills after Implementing the Learning Management Model on Enhancing Students' Entrepreneurial Skills

Entrepreneurial Skills	$\bar{X}$	S.D.	Interpretation
1. Entrepreneurial thinking skills	4.66	0.55	Very High
2. Hands-on practice and project management skills	4.56	0.57	High
3. Communication and community presentation skills	4.76	0.47	Very High
4. Basic business management skills	4.42	0.57	High
5. Courage and time management skills	4.54	0.57	Very High
6. Business research skills	4.50	0.57	High
7. Entrepreneurial attitude	4.70	0.46	Very High
Overall	**4.59**	**0.54**	Very High

Table 3 illustrates that that the evaluation of students' entrepreneurial skills after implementing the learning management model revealed an overall mean score of 4.59 with a standard deviation of 0.54, which was at a very high level. When considering each aspect, the highest mean score was in communication and collaboration skills ($\bar{X} = 4.76$, S.D. $= 0.47$), followed by entrepreneurial attitude ($\bar{X} = 4.70$, S.D. $= 0.46$) and entrepreneurial thinking skills ($\bar{X} = 4.66$, S.D. $= 0.55$). These aspects also had relatively low standard deviations, indicating that most students had similar opinions in these areas. The aspects of project implementation and management skills ($\bar{X} = 4.56$, S.D. $= 0.57$) and design skills ($\bar{X} = 4.54$, S.D. $= 0.57$) were also at a very high level. The lowest mean scores were found in business research skills ($\bar{X} = 4.50$, S.D. $= 0.57$) and basic business management skills ($\bar{X} = 4.42$, S.D. $= 0.57$); however, both remained at a high level.

Part 3 : Results of Local Business Establishments' Satisfaction Toward the Learning Management Model

Table 4 : Enterprise Satisfaction Toward the Learning Management Model on Enhancing Entrepreneurial Skills

Item	$\bar{X}$	S.D.	Satisfaction Level
A. Learning Management Model			
1. The model and learning activities are appropriate and aligned with learners' needs	4.67	0.58	Very High
2. Activities are arranged according to learners' aptitudes and interests	4.33	0.58	High
3. Promotes development of occupational skills	4.67	0.58	Very High
4. Overall suitability of the learning management model	4.33	0.58	High
5. Appropriate time allocation for activities	4.33	0.58	High
Subtotal	**4.47**	**0.58**	**High**
B. Instructional Media Supporting the Model			
6. Uses a variety of teaching media	4.67	0.58	Very High
7. Involves knowledgeable and expert resource persons	4.33	0.58	High
8. Uses media that stimulate learners' interest	4.33	0.58	High
Subtotal	**4.44**	**0.58**	**High**

Item	$\bar{X}$	S.D.	Satisfaction Level
C. Assessment and Evaluation			
9. Uses diverse methods of assessment and evaluation	4.67	0.58	Very High
10. Involves self-assessment, peer assessment, local wisdom persons, parents, and enterprises	4.67	0.58	Very High
Subtotal	**4.67**	**0.58**	**Very High**
D. Benefits Received from the Model			
11. Helps learners recognize the value of the local community in Ban Phaeo District	4.67	0.58	Very High
12. Develops learners' desirable characteristics for entrepreneurship	4.67	0.58	Very High
13. Develops entrepreneurial skills that can be applied in real occupations	5.00	0.00	Very High
Subtotal	**4.78**	**0.39**	**Very High**
Overall	**4.59**	**0.53**	**Very High**

Table 4 illustrates that the local enterprises' overall satisfaction with the developed learning management model was at the highest level ($\bar{X}$ = 4.59, S.D. = 0.53). The Benefits Received dimension yielded the highest satisfaction score ($\bar{X}$ = 4.78, S.D. = 0.39), followed by 'Assessment and Evaluation' ($\bar{X}$ = 4.67, S.D. = 0.58). Although the 'Learning Management Model' and Instructional Media dimensions were rated at a high level, the overall findings demonstrate that the P-P-I-D-P-E model is highly appropriate and effective. This underscores its success in bridging academic theory with practical community-based applications.

Discussion

The results regarding the development of a project-based learning model in collaboration with local enterprises to enhance students' entrepreneurial skills revealed that, after the implementation, students' entrepreneurial skills were at the highest level ($\bar{X}$ = 4.59). Specifically, the communication and collaboration dimension yielded the highest mean score ($\bar{X}$ = 4.76). When considering the effect size, the analysis revealed a Cohen's d value of 5.22, indicating an exceptionally large effect size according to Sawilowsky's (2009) criteria. This reflects the substantial practical impact of this learning model on student skill development. This success stems from the P-P-I-D-P-E learning process, which provides students with opportunities for Situated Learning through real-world practice with the Agarwood Community Enterprise. By encountering authentic business challenges, students were able to construct knowledge through problem-solving and effectively bridge the gap between theoretical concepts and community-based contexts. These findings align with the research of Nuaiplot (2021), who found that project-based learning enhances analytical thinking skills. They also support the concepts proposed by Kitcharoenrueng et al. (2022) and Phromma (2023), who noted that experiential learning promotes the development of essential 21st-century skills. Furthermore, this is consistent with the findings of Mala and Chanthakoon (2024), who emphasized that active learning management is a critical factor in promoting learner competency and fostering practical skills. Additionally, the model achieved the highest level of satisfaction from local enterprises ($\bar{X}$ = 4.59), particularly in the dimension of practical career application. This confirms that the learning model successfully fosters digital entrepreneurial competencies that meet local labor market demands and facilitates a concrete transition from academic instruction to real-world implementation within local community

enterprises. that the P-P-I-D-P-E model effectively transforms students from passive learners into Digital Solutions Providers who are both technologically savvy and community-oriented.

Conclusion

The development of the project-based learning model in collaboration with local enterprises, structured into the six-step P-P-I-D-P-E process (Problem Identification, Planning, Implementation, Development and Improvement, Presentation, and Evaluation), was validated by experts as a highly comprehensive and effective framework for bridging academic theory with real-world practice. The implementation of this model significantly enhanced students' entrepreneurial skills to the highest level ($\bar{X}$ = 4.59), with the most notable growth in communication and collaboration, followed by entrepreneurial attitude and thinking; these results were further substantiated by a very large effect size (Cohen's = 5.22), confirming the model's substantial practical impact. Furthermore, local enterprises expressed the highest level of satisfaction ($\bar{X}$ = 4.59), particularly regarding the tangible benefits received, which underscores the model's success in creating a mutually beneficial partnership that produces both high-quality student competencies and practical value for community-based businesses, ultimately proving its appropriateness for modern educational and professional contexts.

Suggestion

For practical implementation, educational institutions should integrate the P-P-I-D-P-E model into various practice-oriented curricula by fostering partnerships with local enterprises that can serve as co-educators, thereby providing students with authentic experiential learning environments. Instructors are encouraged to further enhance students' digital entrepreneurial competencies by incorporating advanced digital tools for project management and professional presentations, while maintaining a continuous feedback loop among students, faculty, and community stakeholders. For future research, a longitudinal study is recommended to track the long-term career outcomes and business ventures initiated by graduates to assess the model's lasting impact. Additionally, comparative studies across different academic disciplines and various types of community enterprises should be conducted to validate the model's versatility and scalability, ultimately supporting its adoption as a sustainable framework for higher education and local economic collaboration.

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