

The Development of a Blended Learning Model Using Case Studies and Business Model Concepts to Enhance Business Planning Skills in Applying Science and Mathematics for Nursing Students in Mae Rim District, Chiang Mai

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Abstract

This study aimed to develop and evaluate a blended learning model integrating case studies and business model concepts to enhance business planning skills and the application of science and mathematics in everyday life among nursing students in Mae Rim District, Chiang Mai Province. The research employed a mixed-methods approach with 150 nursing students as the sample. Data collection instruments included surveys, semi-structured interviews, lesson plans, and assessments of learning outcomes. The model consisted of three core components: instructional elements (teachers, students, case studies, digital technology, and learning environment), a structured learning process (preparation, case analysis, learning activities, presentation, and evaluation), and dual platforms (online and classroom-based). The findings revealed a statistically significant improvement in business planning skills, as evidenced by post-test scores ($p < 0.05$), alongside high levels of student satisfaction and expert validation of the model's appropriateness. The study underscores the model's effectiveness in fostering critical thinking, problem-solving, and the integration of theoretical knowledge into practical applications. The results suggest that the blended learning approach is a robust framework for enhancing educational outcomes, particularly in nursing education. Recommendations include further refinement of the model for diverse educational contexts and ongoing support for digital competency development.

Keywords Blended Learning, Case Study, Business Model Concept, Nursing Education, Science and Mathematics Integration

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Introduction

In 2022, the Thai government implemented a policy aimed at promoting and developing small and medium enterprises (SMEs) as a strategic cornerstone for long-term economic recovery. This policy seeks to support both established and emerging SME entrepreneurs, recognizing their role as pivotal drivers of economic growth, job creation, and workforce development. As a result, the initiative expands Thailand's business and tax base, generating revenue for continued national development. This effort aligns with the Department of Industrial Promotion's New Entrepreneurs Creation (NEC) project, which emphasizes equipping entrepreneurs with academic knowledge, modern business management practices, and advanced technologies. Key elements of the initiative include training in strategic planning, marketing, finance, personnel management, and business operations to foster the successful creation and sustainability of business plans (Department of Industrial Promotion, 2022).

Despite these measures, many entrepreneurs struggle with developing effective business plans, a critical skill in today's rapidly evolving technological landscape. A robust business plan is essential for providing a clear overview of an enterprise, identifying potential risks, and devising strategies for sustainable growth. Furthermore, effective business planning clarifies organizational goals, enhances stakeholder confidence, and articulates a clear vision and objectives. Business models play a significant role in this process, offering structured frameworks to analyze business components, define strategic approaches, evaluate plan effectiveness, and select suitable models for implementation. This approach is crucial for optimizing organizational potential and fostering sustainable market growth (Bank of Thailand, 2018).

Blended learning has emerged as an innovative educational strategy that combines online and face-to-face (F2F) instructional methods to enhance interactions between instructors and learners. By integrating digital tools with traditional classroom instruction, blended learning accommodates diverse educational needs and bridges gaps in conventional teaching. Research indicates that this approach fosters a deeper understanding of content and enables learners to independently solve complex problems (Johnson et al., 2006). Similarly, case study-based learning emphasizes real-world applications by presenting scenarios that align with educational objectives. This method promotes analytical thinking, problem-solving, and critical application of theoretical principles. Instructors play a vital role in this process by preparing relevant data, facilitating discussions, and guiding learners in exploring multiple perspectives and solutions.

Thailand's education strategy aims to enhance national competitiveness by fostering professional skills across all sectors. This strategy is rooted in three core principles: building on past successes, adapting to present realities, and creating value for the future. It emphasizes equipping graduates with internationally competitive skills, particularly in fields such as social sciences, science, and business administration. Through this approach, learners gain the knowledge and skills necessary for effective personal and professional planning. A crucial aspect of the strategy is refining business models to meet the needs of public and private labor markets. By doing so, it enhances learners' understanding of trade and investment systems, expands career opportunities, and reduces social inequality. This framework supports the growth of a strong middle class, a vital component of societal and economic progress (Office of the

Higher Education Commission, 2022). The integration of life and professional skills into nursing education is particularly significant. Nursing students require practical competencies, such as communication, patient care, treatment planning, and problem-solving under high-pressure conditions. Strengthening these skills prepares them to adapt to advancements in medical technology and evolving healthcare systems. Consequently, Thailand's education strategy plays a critical role in producing nursing graduates equipped with both professional expertise and life skills to meet the challenges of a dynamic labor market while contributing to social equity and improved quality of life.

To address these challenges, the Nursing Science curriculum at educational institutions in Mae Rim District, Chiang Mai Province, has incorporated the Science and Mathematics in Daily Life course as part of the Bachelor of Nursing Science program. This course aims to develop intellectual skills and digital literacy among students. It covers topics such as numerical analysis, personal financial management, utility calculations, investment selection, interest and insurance premium calculations, statistical data collection for surveys and decision-making, and the application of science, mathematics, and statistics in everyday life. Examples include financial value analysis, feasibility studies, business plan development, quantitative analysis, and research. The course is designed to provide students with a solid foundation in business management, finance, and the application of scientific principles in daily life, preparing them for future challenges. Given that students initially lacked knowledge in business planning and finance, the faculty has developed a blended learning model that combines case study-based teaching with business model frameworks, specifically tailored for nursing students. The objective is to enhance students' business planning skills, foster creativity, and encourage knowledge exploration in alignment with the curriculum's goals. This approach is intended to equip students with practical skills that promote personal development and prepare them for future leadership roles in organizational management.

Objectives

1. To investigate the current conditions, challenges, and needs associated with implementing a blended learning model that integrates case-based teaching with the business model concept. This investigation aims to enhance business planning skills and the practical application of science and mathematics in daily life among nursing students in Mae Rim District, Chiang Mai Province.
2. To design and develop a blended learning model that incorporates case-based teaching with the business model concept, focusing on improving nursing students' business planning skills and fostering the integration of science and mathematics into real-world scenarios.
3. To evaluate the implementation process of the blended learning model using case-based teaching and the business model concept, assessing its impact on enhancing business planning skills and the practical application of scientific and mathematical knowledge among nursing students in Mae Rim District, Chiang Mai Province.
4. To assess the effectiveness and appropriateness of the blended learning model that incorporates case-based teaching with the business model concept. This assessment includes

measuring improvements in nursing students' business planning skills, their ability to apply scientific and mathematical knowledge in daily life, and their overall satisfaction with the learning model.

Research Framework

This research is grounded in the development of a blended learning model that integrates case-based teaching with the business model concept to enhance nursing students' business planning skills and their ability to apply science and mathematics in everyday life. The framework synthesizes concepts from blended learning theories, case study methodologies, and business model frameworks, aiming to provide a holistic approach to skill development.

Key Theoretical Foundations: 1) Blended Learning Theory, Blended learning combines online and face-to-face instructional methods to create a dynamic and flexible learning environment. According to Garrison and Vaughan (2008), this approach supports active learning by encouraging interaction among students, instructors, and content. It leverages digital tools to facilitate knowledge construction, critical thinking, and problem-solving. In this study, blended learning provides the foundation for integrating digital technology with traditional classroom techniques, enhancing the accessibility and depth of learning experiences. 2) Case Study Methodology, Case study teaching is rooted in experiential learning theory (Kolb, 1984), which emphasizes the importance of real-world applications in fostering meaningful learning. This method engages students in analyzing, discussing, and solving complex, context-specific problems. It aligns with nursing education goals by promoting critical thinking, decision-making, and reflective practice—essential skills for healthcare professionals and 3) Business Model Framework, The study employs the Canvas Business Model (Osterwalder & Pigneur, 2010) as a conceptual tool for teaching business planning. This framework provides a structured approach to understanding and designing business strategies, focusing on key components such as value proposition, customer relationships, channels, revenue streams, and cost structures. Integrating this model with science and mathematics applications allows students to bridge theoretical knowledge with practical business skills.

Components of the Framework: 1) Teaching Management, 1.1) Instructor: Guides the learning process, prepares case materials, and facilitates both online and face-to-face discussions. 1.2) Learner: Actively engages with the content, participates in collaborative activities, and applies knowledge to real-world contexts. 1.3) Case Studies: Real-world scenarios tailored to integrate business concepts with scientific and mathematical principles. 1.4) Digital Technology: Tools such as learning management systems (LMS), interactive software, and communication platforms support blended learning. 1.5) Learning Environment: A combination of physical classrooms and virtual platforms ensures an inclusive and adaptable educational setting. 2) Blended Learning Process, 2.1) Preparation: Students and instructors establish objectives, set expectations, and prepare necessary resources. 2.2) Learning Strategy: Integration of online modules and face-to-face sessions tailored to the curriculum. 2.3) Analysis: Students critically evaluate case studies, applying theoretical frameworks to identify challenges and propose solutions. 2.4) Creation and Presentation: Teams develop business plans and present their findings. 2.5) Evaluation: Feedback

mechanisms include self-assessment, peer reviews, and instructor evaluations to measure learning outcomes. 3) Canvas Business Model Components, 3.1) Defining "How": Identifying steps and methods for delivering value. 3.2) Clarifying "What": Specifying the product or service being developed. 3.3) Focusing on "Who": Analyzing customer relationships and channels and 3.4) Highlighting "Money": Understanding revenue streams and cost structures.

Framework Application: The framework operationalizes these components through a structured implementation process. 1) Orientation: Familiarizes students with blended learning tools and the objectives of the course. 2) Contextual Study: Introduces the fundamentals of business planning, emphasizing its integration with science and mathematics. 3) Collaborative Case Analysis: Encourages teamwork in analyzing case studies using the Canvas Business Model. 4) Interactive Activities: Blends theoretical knowledge with practical applications in both online and classroom settings. 5) Feedback and Iteration: Provides continuous opportunities for improvement through formative assessments. Illustrative Diagram, the conceptual framework is visually represented in Figure 1, highlighting the interplay between teaching management, blended learning processes, and the Canvas Business Model.

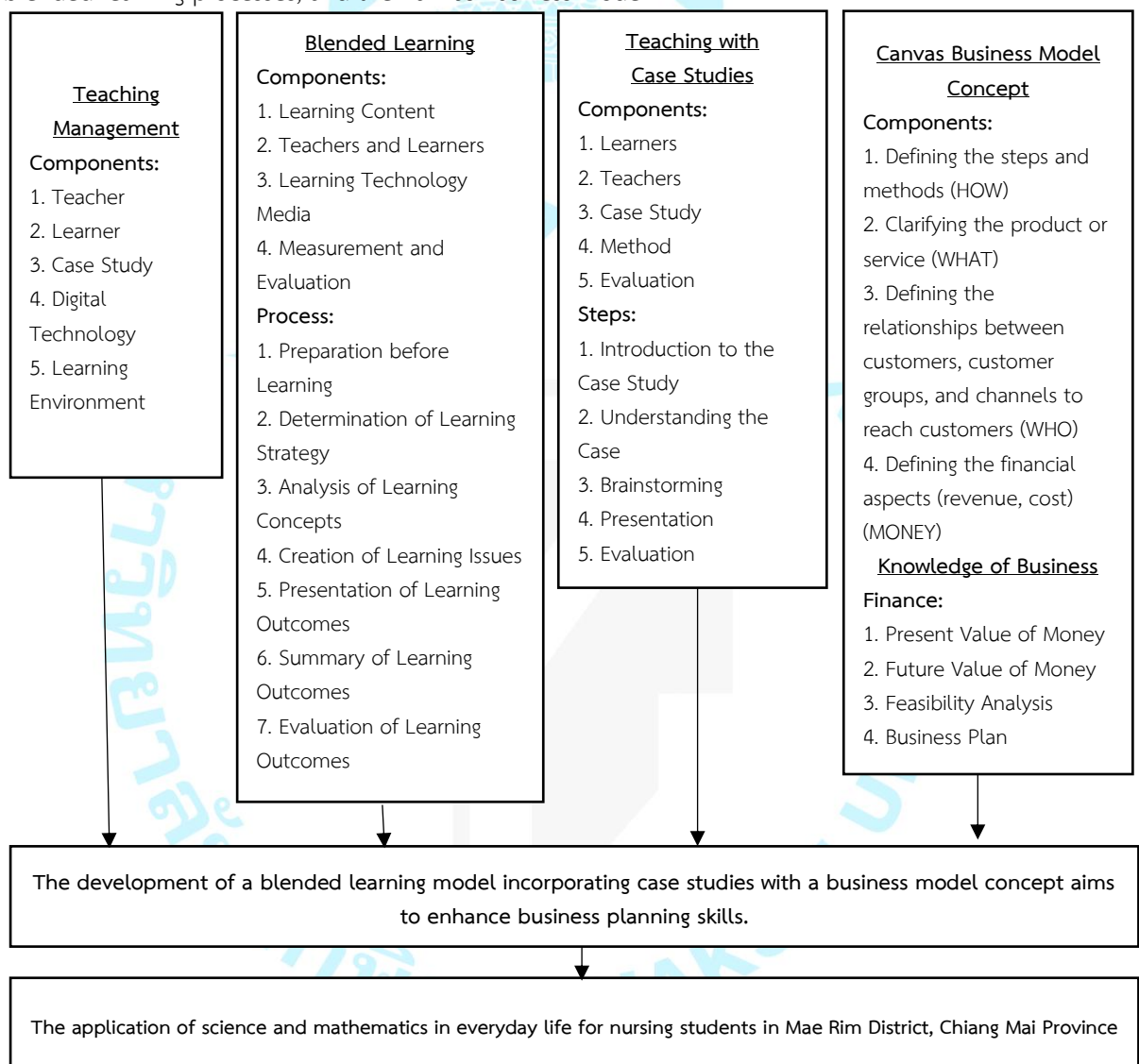


Figure 1 Research Framework

Research Methodology

This research focuses on the development and implementation of a blended learning model that integrates case study methods with the business model concept to improve business planning skills in the context of science and mathematics for nursing students in Mae Rim District, Chiang Mai Province. The detailed research methodology is outlined as follows.

1. Population and Sample, 1.1) Population, The population for this study comprises 150 undergraduate nursing students enrolled in science and mathematics courses during the first semester of the 2024 academic year. These students are part of the nursing curriculum at educational institutions located in Mae Rim District, Chiang Mai Province, Thailand. This population was chosen due to its relevance to the research objectives, as the courses integrate science, mathematics, and business planning, which align with the study's focus. **1.2) Sample Selection,** The sample was selected using purposive sampling, a non-probability sampling method widely used in educational research. This method ensures the inclusion of participants with specific characteristics that align with the research objectives (Creswell & Creswell, 2018). The criteria for selecting the sample included, 1.2.1) Enrollment in the science and mathematics courses within the nursing curriculum and 1.2.2) Willingness to participate in the blended learning program incorporating case-based teaching with the business model concept. The final sample size of 150 students was determined based on guidelines for educational research and practical constraints, ensuring adequate representation while maintaining feasibility for data collection and analysis (Fraenkel, Wallen, & Hyun, 2012). **1.3) Justification for Sample Size,** The sample size was deemed sufficient to achieve statistical power for detecting significant differences and patterns in the data. As suggested by Cohen (1988), an appropriate sample size increases the reliability and validity of the study findings while ensuring representativeness. **1.4) Sample Characteristics,** The demographic characteristics of the sample were as follows, 1) Predominantly female students (95%), reflecting the gender distribution typical in nursing education and 2) Age range of 18–19 years, with the majority in their first year of study (99%). **1.5) Ethical Considerations,** Participation was voluntary, with informed consent obtained from all students before the study commenced. The study adhered to ethical guidelines for research involving human subjects, including confidentiality and the right to withdraw without penalty (American Psychological Association, 2020).

2. Research Instruments, To achieve the research objectives and ensure alignment with the conceptual framework, the following research instruments were developed and employed. Each instrument was designed to systematically gather relevant data and evaluate the effectiveness of the blended learning model. **2.1) Survey on Status, Problems, and Needs,** 1) Purpose, to identify the current conditions, challenges, and needs related to the implementation of a blended learning model that integrates case-based teaching and the business model concept. 2) Design, A structured questionnaire with Likert-scale items and open-ended questions, validated through expert review to ensure content validity (Creswell & Creswell, 2018). 3) Application, distributed to participants to assess their experiences, perceptions, and needs regarding blended learning. **2.2) Semi-Structured Interview,** 1) Purpose, to explore in-depth the perspectives of participants, including both students and instructors, on the implementation and effectiveness of

the blended learning model. 3) Design, an interview guide with open-ended questions informed by the study's objectives. The framework allowed flexibility to probe specific issues raised by respondents. 3) Application, conducted with a purposive subset of participants to complement quantitative data with qualitative insights, enhancing the richness and depth of the findings (Kvale & Brinkmann, 2015).

2.3) Blended Learning Model Incorporating Case Studies with the Business Model Concept, 1) Purpose, to provide a structured educational tool for integrating case study methodology and business model concepts into science and mathematics education for nursing students. 2) Development: The model was designed based on the blended learning framework (Garrison & Vaughan, 2008), experiential learning theory (Kolb, 1984), and the Canvas Business Model (Osterwalder & Pigneur, 2010) and 3) Application: Implemented as the primary intervention in the study, with iterative refinements based on formative feedback.

2.4) Blended Learning Management Plan, 1) Purpose, to establish a detailed plan for managing the blended learning model, including instructional strategies, timelines, and resources. 2) Design: Developed using instructional design principles (Gagné et al., 2005) and aligned with the study's learning objectives and 3) Application: Served as a guideline for instructors, ensuring consistency in the delivery of the blended learning model across different settings.

2.5) Student Satisfaction Assessment of Learning Models, 1) Purpose: To evaluate student satisfaction with the blended learning model and its teaching methods. 2) Design: A validated survey instrument measuring various dimensions of satisfaction, including content relevance, instructional quality, and ease of use of digital tools (adapted from previous satisfaction scales, e.g., Richardson & Swan, 2003) and 3) Application: Administered post-implementation to capture student feedback and identify areas for improvement.

2.6) Blended Learning Model Certification Assessment, 1) Purpose, to certify the effectiveness and quality of the blended learning model, ensuring it meets academic and practical standards. 2) Design, A rubric developed with input from subject matter experts, incorporating criteria such as alignment with learning objectives, effectiveness of case studies, and integration of the business model concept and 3) Application: Evaluated by a panel of experts and instructors to validate the model's applicability and scalability in nursing education.

3. Research Data Collection, The data collection spanned seven weeks, beginning with Week 1: Preparation and Orientation, where participants were introduced to the blended learning framework, case study methodology, and Canvas Business Model concepts. This stage emphasized integrating business planning with science and mathematics, providing foundational knowledge for subsequent activities. From Weeks 2–7, participants engaged in joint case studies and learning activities. During Weeks 2–3, a collaborative learning activity (Case Study 1) introduced case-based learning and problem-solving through group discussions. In Weeks 3–4, a second case study deepened understanding of the business model concept, focusing on financial and operational planning. Weeks 4–5 integrated financial planning through a third case study, emphasizing feasibility analysis and the creation of comprehensive business plans. The final phase, Weeks 6–7, involved presentations, discussions, and evaluations. Participants presented their business plans, received feedback, and reflected on their learning outcomes. These activities developed critical thinking, teamwork, financial planning, and presentation skills, while reinforcing the application of blended learning and business model concepts. This systematic process ensured

participants effectively engaged with the research objectives, demonstrating significant skill development and readiness for practical applications.

4. Data Analysis, Quantitative and qualitative methods were utilized to evaluate the blended learning model's effectiveness comprehensively. **1) Quantitative Analysis**, Survey data on status, challenges, and needs were analyzed using descriptive statistics (percentages, means, standard deviations). Paired *t*-tests assessed improvements in business planning skills through pre- and post-test scores, while ANOVA examined group performance differences to evaluate intervention impacts. **2) Qualitative Analysis**, Thematic analysis of semi-structured interview data identified key themes on model effectiveness. Observational data from case studies were coded to analyze collaboration, engagement, and application of business model concepts. Integrated Analysis, Triangulation of survey, interview, and assessment data ensured validity and reliability. Expert evaluations, using rubrics, objectively measured business plan quality. Findings, presented through tables and graphs, highlighted statistical trends and significance. Direct quotes from qualitative data provided contextual insights, supporting a comprehensive evaluation of the blended learning model's impact on participants' skills and engagement.

Research Results

1. Results of the Study on the Conditions, Problems, and Needs of Blended Learning Using Case Study Learning with the Business Model Concept to Enhance Business Planning Skills, Business Model Concept in Science and Mathematics in Daily Life. The study is divided into two parts. **Part 1, Results of the Study on Students' Opinions Regarding Blended Learning**, 1) Basic Information of Students, Analysis of personal data from respondents revealed that the majority were female (95.00%), aged between 18 and 19 (96.00%), and currently in their first year of study (99.00%). 2) Experience with Blended Learning, all respondents (100%) had experience with blended learning, including both classroom and online components. Additionally, 88.00% of students believed that online learning activities for business planning using the Business Model Canvas should primarily consist of lectures and activities. 3) Opinions on Abilities, Problems, and Needs, Table 1 presents the results of the analysis regarding opinions on abilities, problems, and needs.

Table 1 Analysis of Opinions on Abilities, Problems, and Needs

Opinions on Abilities, Problems, and Needs	\bar{x}	S.D.
Use of Learning Technology	4.25	0.21
Current Situation of Blended Learning Management	4.28	0.32
Problems in Blended Learning Management	4.31	0.76
Needs for Blended Learning Management	4.35	0.54

Part 2, Results of the Study of Experts' Opinions, the tools used for data collection were semi-structured interviews. The results are as follows, **1) Blended Learning Approach with Case Studies to Enhance Business Planning Ability, to improve business planning skills, incorporating business model concepts in science and mathematics into everyday life**, the details are as follows, 1.1) For teachers, teaching methods should be clearly defined for their role

during the orientation stage before learning. This includes setting learning conditions for both online and classroom settings, arranging the environment, and providing support materials for online learning, such as communication channels. 1.2) For learners, understanding the purpose of the learning process is crucial to maximize the benefits of the subject. Both learners and teachers should be familiar with the systems used to support online teaching. 2) Blended Learning Formats, 2.1) Blended learning should incorporate a variety of teaching methods tailored to the content, including both theoretical and practical aspects. 2.2) Classroom teaching should be enhanced by integrating information technology tools in an online format to increase learner motivation. 3) Blended Learning with Case Studies, this approach promotes analytical thinking processes and understanding of business principles, which can be applied or initiated in business contexts. 4) Components of Blended Learning, for case studies to effectively enhance business planning skills, communication channels should be established for knowledge exchange and information sharing among learners. 5) Proportion of Face-to-Face and Online Learning, Blended learning should emphasize online learning more. Currently, learners are capable of self-learning theoretical content but should receive additional practical experience. Recommended proportions are 30% online and 70% face-to-face. 6) Appropriate Activities, 6.1) Classroom teaching should focus on knowledge exchange activities. 6.2) Online teaching should involve self-understood content on business planning theory and business model concepts, including business finance, present value of money, future value of money, project feasibility analysis, business plans, and the Canvas Model. 7) Blended Learning with Case Studies, this should consist of six steps, 7.1) Preparation/Orientation 7.2) Business Plan Context Study 7.3) Joint Case Study 7.4) Learning Activity 7.5) Presentation/Discussion 7.6) Summary and Evaluation. This approach helps enhance business planning skills and is suitable for creating comprehensive learning activities. Group activities should include communication channels within subgroups to facilitate knowledge exchange outside of class and enable teachers to observe and assist students. 8) Blended Learning Approach, the six steps are appropriate, but each step should be clearly detailed. 9) Blended Learning Components, the five components are suitable, making the overall process and function of each component clear. 10) Teaching and Learning Activities, these should encourage student cooperation within groups to share opinions and brainstorm for the best alternatives. 11) Group Activities, Blended learning with case studies and business planning should involve group activities for students to share opinions and collaboratively create learning experiences. 12) Evaluation Criteria, Criteria for evaluating business planning work should include, 1) Assessment of group work according to teacher-defined activities and 2) Expert evaluation of the work's ability.

2) The results of developing blended learning models with case study teaching using business planning concepts to enhance business planning skills, as well as integrating business model concepts in science and mathematics into daily life, are as follows, 2.1) The creation of blended learning models using case study methods combined with business planning concepts is divided into three parts, Part 1, Introduction, Includes 1) Concepts and principles of the models, and 2) Objectives of various models. Part 2, Blended Learning Models, covers 1) Learning models, 2) Components of models, 3) Steps of the models, and 4) Learning management plans and evaluation of the models. Part 3, Implementation Methods and Conditions, Details methods and conditions for implementing the blended learning models, including a verification

process, with certification by a panel of experts in systematic research. 2.) The evaluation of the suitability (draft) of the blended learning model, which combines case study learning with business planning concepts, received an average score at a high level (\bar{x} = 4.18, S.D. = 0.54). 2.3) The evaluation of the overall teaching plan, which integrates case study learning with business planning concepts, received an average score at the highest level (\bar{x} = 4.39, S.D. = 0.17). 2.4) The evaluation of the quality of blended learning media, incorporating case study learning with business planning concepts and business model concepts in science and mathematics in daily life, resulted in an overall score at the highest level (\bar{x} = 4.38, S.D. = 0.42).

3) The results of the experiment using the blended learning model with case study teaching in business planning to enhance business planning skills, as well as integrating business model concepts in science and mathematics into daily life, are as follows, the comparison of average scores before and after studying with the blended learning model revealed a significant difference. Statistical testing showed $t = 12.54$, $Sig = 0.000$, indicating that the average scores before and after studying differed significantly at the 0.05 level. The average score after studying (\bar{x} = 22.52, S.D. = 0.54) was significantly higher than the average score before studying (\bar{x} = 3.54, S.D. = 2.85).

4. The certification results of the blended learning model with case study teaching using business planning concepts and business model concepts in science and mathematics in daily life were assessed by experts. The overall mean score for the appropriateness of the blended learning model was at a high level (\bar{x} = 4.25, S.D. = 0.89).

Conclusion

The study reveals that blended learning using case study methods and business planning concepts significantly enhances business planning skills. Students, predominantly first-year females aged 18-19, expressed positive feedback on blended learning experiences, with 100% having prior exposure to both classroom and online learning components. The integration of business model concepts, particularly in science and mathematics, into daily life was well-received. Experts emphasized the need for clear guidelines for teachers, student understanding, and effective use of technology. The study identified that a 30% online and 70% face-to-face learning format would be optimal. Notably, the blended learning model was successful in promoting analytical thinking, collaboration, and knowledge exchange, with evaluations indicating a high level of satisfaction (average score 4.39). The comparison of pre- and post-study scores demonstrated a significant improvement in students' abilities ($t = 12.54$, $Sig = 0.000$). The blended learning model, combining case studies with business planning and business model concepts, received positive certification from experts, further supporting its effectiveness in fostering business planning skills and practical application in real-life contexts. These findings highlight the potential of blended learning in enhancing students' competencies in business planning.

Discussion

The investigation into the blended learning model, which integrates case study teaching with business planning concepts to enhance business planning abilities and the application of business

model concepts in daily life, yielded several significant findings. The study revealed that all students (100%) engaged in both classroom and online learning, with mobile phones and iOS devices being the primary tools for online learning. A significant portion (86%) accessed the internet via mobile phone networks, spending an average of 5-8 hours per day online, with 98% of students reporting this usage. Notably, 95% of students expressed a preference for online learning activities in business planning, specifically advocating for lectures and interactive sessions using the business model canvas. These findings underscore the demand for blended learning in nursing schools in Mae Rim District, Chiang Mai Province, highlighting the context-specific needs and pedagogical approaches for integrating science and mathematics into daily life.

Educational institutions must respond to the capabilities and needs required to develop students' business planning proficiency. Participation in practical activities such as financial investment planning, project feasibility analysis, and entrepreneurial initiatives enables students to cultivate critical life skills like investment management, debt handling, and risk management. These competencies are essential for nursing students and align with local higher education policies that emphasize curricula that foster economic and social development (Suwuttho, 2012). Effective learning management is key to helping students achieve these outcomes, necessitating deliberate design and development of learning processes that prioritize student needs and bridge theoretical knowledge with real-world application.

This finding is consistent with Suthida Prechanont's (2021) research on preparing students for entrepreneurship within the creative economy. Prechanont identified essential characteristics of creativity, including continuous learning, valuing ideas, and perseverance. Her study developed activities to nurture these traits, with activities tailored by academic year. Year 1 involved academic lectures, Year 2 added creative thinking and worldview-broadening activities, and Years 3 and 4 included career training, internships, and career guidance. These entrepreneurial preparation activities are consistent with the goals of fostering creativity and practical business skills, making them complementary to the blended learning model in this study.

The blended learning model, incorporating case study-based business planning and business model concepts, received high evaluation scores, particularly in terms of its effectiveness and media quality. The experimental results demonstrated a significant improvement in students' business planning abilities, with post-learning scores markedly higher than pre-learning scores (statistical significance at the 0.05 level). This suggests that the model was highly effective in enhancing both theoretical understanding and practical application, with students showing considerable improvements in their ability to apply business model concepts to real-world scenarios, particularly in science and mathematics contexts. The high level of student satisfaction further supports the model's effectiveness and appropriateness in fostering business planning competencies. These findings are supported by recent research, which highlights the importance of blended learning in enhancing both knowledge and practical skills in diverse fields (Martin & Lavolette, 2021).

Overall, the blended learning model not only improves students' business planning abilities but also offers a comprehensive approach to integrating real-world applications, preparing students for entrepreneurial roles and fostering life skills critical for personal and professional development.

Recommendations

The research highlights the effectiveness of blended learning models that combine case study learning and business planning concepts in enhancing students' business planning abilities and applying business model concepts in real-world contexts, particularly in integrating science and mathematics into daily life. To effectively implement this model, both teachers and students must develop foundational technological skills and ensure reliable access to equipment and stable internet connections. Teachers should demonstrate the tools used in the blended learning process and provide training sessions or user guides to ensure smooth application. Furthermore, fostering an interactive online environment is crucial for student engagement and achieving desired outcomes. Educational institutions are encouraged to adopt blended learning models, emphasizing student-centered approaches that support practical learning, such as through platforms like Zoom, Google Classroom, and YouTube. By integrating these strategies, students can apply acquired knowledge to real-life situations, fostering critical life skills and ensuring their continuous development in alignment with educational policies. These practices will significantly improve student learning outcomes and contribute to their personal and professional growth.

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