The Effect of Using a Blended Learning Model with an Active Learning Approach to Enhance the Competence in Information and Communication Technology of Nursing Students.

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Abstract— The purposes of this development research were study result by using the model of blended learning by using active learning method. Quasi-experimental research. The sample were 60 first year nursing students at Nursepolice. They were divided into 3 experimental groups (high, moderate, and low level) each group comprised of 20 students. The research instruments were: 1) achievement test, 2) skill assessment, 3) innovation assessment, and 4) satisfaction survey form. Data were analyzed by: Mean, Standard Deviation, Paired Sample t-test, ANOVA, and Pearson Correlation Coefficient.
Research findings were as follows: 1) the knowledge in the learning achievement were higher than pre-test significance at the .01 different, 2) skill and innovation of three experimental groups after experiment were not different, 3) pre-test score of high level group had a positive, statistically significant correlation with post-test score at moderate level (r = 0.46, p = .01), 4) pre-test score of knowledge had a positive, statistically significant correlation with post-test score at a moderate level (r = 0.49, p = .00), 5) the students' satisfaction on the BLALM model were at highest level (= 4 .66, SD = .62).. ***(Abstract)***

Keywords-"Blended Learning Model by Using Active Learning Method" "Information and Communication Technology Competencies" (key words)

I. INTRODUCTION

In Thailand, educational management is governed by the National Education Act of 1999, Article 15. This article outlines three formats of educational management: 1) Formal Education, which includes predetermined objectives, teaching methods, curriculum, duration, and assessment criteria, all of which are essential conditions for successful completion of education. 2) Non-formal Education, which possesses flexibility in defining objectives, formats, teaching methods, curriculum, duration, and assessment criteria.[1] These are crucial conditions for successful education as they need to be suitable and aligned with the problems and requirements of each individual group. 3) Informal Education, which encourages self-learning based on personal interest, potential, readiness, and opportunities. It involves learning from individuals, social experiences, environment, media, or other sources of knowledge. Hence, learners can receive lifelong education through these three principal formats, including the integration of various technologies, emphasizing learner-centered teaching methods. These efforts fall under the Ministry of Education's educational development plan that is appropriate and aligned with the current and future situations.[2]

Policy and Strategy Bureau, Office of the Permanent Secretary, Ministry of Education (2016), under the 12th Education Development Plan (2017-2021), focusing on remote education technology development strategies, addresses the enhancement and advancement of digital technology systems for education. This encompasses the development of information technology and educational network technology, covering comprehensive systems for all areas. This is achieved through database management using Cloud Computing systems with standardized storage, import, and distribution of content and courseware. The elevation of educational quality is also achieved through distance learning technology (DLIT, DLTV) via satellite, which broadcasts via Satellite TV and high-efficiency IPTV systems, in addition to supporting schools lacking resources with up-to-date hardware and software tools to accommodate distance education.

Collaboration among relevant units is established to develop high-speed Fiber Optic and wireless internet networks, enabling unlimited access to education. The system ensures extensive data transmission coverage in Wi-Fi zones, allowing large-scale data transmission across various regions. Furthermore, the establishment of online

learning systems through the internet facilitates continuous and accessible learning with easy-to-access student learning databases. The development of standardized Electronic Libraries (E-Libraries) enhances lifelong learning. The continuous enhancement of Computer-Aided Instruction (CAI) optimizes learning outcomes by integrating self-learning programs and self-assessment through self-constructed computer programs, enabling interactive learning similar to in-person classroom settings. The initiative also promotes skill development and innovation through electronic media-based learning, including self-initiated electronic-based Online Tutoring, allowing learners and educators to access modern information and communication technology to support teaching and learning processes, ultimately achieving the highest educational objectives.[3]

In the current era of education, there has been a shift towards focusing on learning outcomes rather than just achieving grades. This means that learners are empowered to generate knowledge and innovate on their own within the global society. There is an awareness of the importance of integrating technology into daily life. Therefore, both educators and learners in the Education 4.0 era must adapt to learning that is in line with the rapidly changing times. In the previous education era, learners were encouraged to create knowledge on their own, but they were unable to effectively transmit and apply that knowledge in their daily lives. In order to achieve the desired learning objectives, continuous development of various skills, especially in information technology, is essential. This technology plays a crucial role in education both now and in the future. It is essential for educators and learners to be able to access and apply up-to-date technology for teaching and learning purposes to achieve the highest educational objectives.

Thailand's ICT Development Index (IDI) by the International Telecommunication Union (ITU) ranked 82nd in 2016, dropping from the previous year's 79th position. However, the score increased from 5.05 to 5.18 (ETDA Thailand, 2017). This indicates Thailand's reduced competitiveness in the field of ICT. Another report by GIT found that Thailand ranked last in education among the 8 ASEAN countries, with Singapore, Malaysia, and Brunei ranking at the top. Cambodia and Vietnam followed, with Thailand in 8th place. Myanmar and Laos were excluded from the survey. The ASEAN ICT Master Plan 2015 set a goal for member countries to bring about new changes in the overall ICT landscape, including the use of ICT for e-education, within 10 years. In the 21st century, learners are expected to enhance and develop their ICT capabilities. To address these challenges, a blended learning approach can be employed, which combines various teaching methods to cater to the needs and differences of individual learners. This method integrates teaching and technology to create activities that promote optimal learning outcomes, meeting the demands of the digital age. The goal is to enable learners to become self-directed learners who continuously improve their ICT skills, thus enhancing their learning capabilities.[5],[6],[7],[8]

In addition to the diverse approach of blended learning, another method that aligns well with learner engagement is Active Learning. Active Learning is an instructional process that emphasizes diverse learning techniques to manage learning. It places significance on the learners themselves, involving them in the learning process, fostering interaction between instructors and peers, as well as encouraging practical engagement and dialogues. This approach allows learners to create knowledge on their own and apply it in different contexts. In this context, the role of the instructor is to facilitate and plan classroom activities, ensuring learners' active participation. Consequently, this method results in higher learner engagement, fostering meaningful learning and alignment with content relevant to information technology and its application in practical skills.[9]

From all the aforementioned aspects, the researchers have recognized the importance of Thai education management in accordance with the National Education Act of 1999. It divides education into three formats: 1) formal education, 2) non-formal education, and 3) informal education, alongside the Ministry of Education's 12th Education Development Plan (2017-2021), which emphasizes the importance of promoting and developing digital technology for education. This underscores the significance of the instructor-learner relationship in classroom-based learning in the current era, particularly in Education 4.0. Educators in this era need to serve as advisors to learners, guiding them to create tangible innovations from their acquired knowledge. This requires educators to incorporate information and communication technology (ICT) effectively in teaching and learning. A survey confirms that educators struggle to use ICT efficiently, as indicated by their performance in the Global Information Technology (GIT) Report.

Hence, it is imperative to formulate diverse strategies to promote and develop ICT competencies among nursing students. These strategies will enable learners to actively participate in the classroom through hands-on activities, receiving information from instructors or peers, giving feedback, quickly reflecting on thoughts, and solving problems on their own. This approach stimulates higher-order thinking skills, including analysis, synthesis, and application, fostering the development of learners' ICT competencies, knowledge, skills, and innovation.

II. Documents and Related Research

The documents and research materials relevant to this study include various aspects of blended learning. 1) The concept of blended learning, 2) The definition of blended learning, 3) The components of blended learning, 4) The management of blended learning, 5) The levels of blended learning, 6) The ratios of blended learning, and 7) The analysis and synthesis of blended learning. Additionally, the Learning Management System (LMS) is explored, covering. 1) The meaning of LMS, 2) The components of LMS, 3) The system's organization of teaching and learning, 4) The software used for LMS, and 5) The advantages and limitations of LMS. The study also delves

into the blended learning environment in the Education 4.0 era, focusing on. 1) The arrangement of learning environments, 2) The Blended Learning Environment in Education 4.0 Model, 3) Teaching and learning methods in the BLEE 4.0 Model, 4) The characteristics of the learning environment in the BLEE 4.0 Model, and 5) Education in the 4.0 era and its innovative production within the BLEE 4.0 Model. Moreover, the study addresses active learning with considerations such as. 1) The definition of active learning, 2) The characteristics of active learning, 3) Methods of active learning, 4) Benefits of active learning, 5) Limitations of active learning, and 6) The analysis and synthesis of active learning. Lastly, the study acknowledges the importance of information technology and communication competencies, encompassing. 1) The meaning and significance of these competencies, 2) Learning skills and innovation 4Cs, and 3) Information technology and communication competencies for nursing students.

III. Research Objectives

The primary objective of this study is to investigate the outcomes of employing a blended learning approach combined with active learning methods. This is done with the intention of enhancing and cultivating the information technology and communication competencies of nursing students.

IV. Research Methodology

This research employs a quasi-experimental comparative posttest design. The population consists of nursing students enrolled in the 2022 academic year. The sample group comprises 70 second-year nursing students from the 2022 academic year. A simple random sampling method was then used to select 60 students for the sample group. These students participated in a technology and communication competency assessment test to categorize them into three groups based on their scores: high-achieving group (20 students), moderate-achieving group (20 students), and low-achieving group (20 students).

A. Research Instruments

- Knowledge Assessment Questionnaire on Information Technology and Communication. This questionnaire consists of 30 multiple-choice questions and was developed by the researcher. The content validity was examined by five experts in the field. It was then pilot-tested on 30 nursing students with similar characteristics to the sample group. The internal consistency of the questionnaire was measured using the KR-20 coefficient, yielding a value of 0.79.
- Competency Evaluation Questionnaire on Technological Innovation and Communication. This questionnaire assesses students' competencies in technological innovation and communication.
- Satisfaction Evaluation Questionnaire. This questionnaire gathers data on nursing students' satisfaction with the blended learning approach combined with active learning methods for enhancing their technology and communication competencies.

B. Data Collection

Experiment Phase

- In the initial data collection stage, the researcher explained the research objectives and the learning methods, including the blended learning approach combined with active learning methods, to the sample group. The researcher also demonstrated the learning steps and the use of various tools for teaching to the sample group.
- After explaining the learning methods and overall teaching approach for the experiment, the researcher conducted a pre-test on the sample group using a questionnaire focused on information technology and communication. This pre-test served as a baseline to collect competency scores in technology and communication.
- The researcher selected a sample group of 60 nursing students to engage in the blended learning approach combined with active learning methods. This 10-week program involved providing knowledge to the sample group through weekly sessions lasting 1 hour each. The researcher aimed to assess technology and communication competency scores of the participants after completing the program.
- During each week of the experiment, the sample group was assigned post-learning exercises designed to enhance their technology and communication competency. These exercises were conducted over a span of 10 weeks, aiming to gauge competency scores in technology and communication skills.
- Throughout the experiment, the researcher provided ideas and techniques for innovation to the participants and assigned tasks to develop innovative solutions based on their learning experiences from the blended learning approach combined with active learning methods. These tasks were integrated into each learning unit, contributing to the collection of competency scores in technology and communication innovation.

Post-Experiment Phase

- After the sample group completed the 10-week blended learning approach combined with active learning methods, the researcher conducted a post-test on their technology and communication competency. This post-test assessed participants' knowledge before and after the program and contributed to the collection of competency scores in technology and communication knowledge.

- The researcher evaluated the innovation outputs of the sample group using an innovation assessment questionnaire. This evaluation aimed to gather competency scores related to technology, communication, and innovation.

C. Data Analysis

1. Descriptive Statistics

Calculate basic descriptive statistics including the mean and standard deviation.[10]

2. Inferential Statistics

2.1 Analyzing data to compare the technology and communication competency scores and knowledge scores of nursing students before and after learning. This will be done using the Paired Sample t-test.[11]

2.2 Analyzing data to compare the technology and communication competency scores among the three sample groups and the average scores for knowledge, skills, and innovation using One-Way Analysis of Variance (ANOVA).[11]

2.3 Analyzing data to determine the level of correlation between the technology and communication competency scores and knowledge scores, skills scores, and innovation scores before and after learning among the three sample groups. This will be achieved using the Correlation Coefficient.[11]

V. RESEARCH RESULTS

Table 1 shows that the average knowledge scores after learning were significantly higher than before learning at a statistical significance level of .05 (n=60).

scores	$\bar{x}$	S.D	t	P
Pre-learning	7.31	3.39	-17.81	.00*
Post-learning	13.29	2.52		

*Statistically significant at .05

Table 2 presents that the average skill scores of the three groups of learners did not differ significantly from each other (n=60).

Source of Variance	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	5.60	2	2.80	.89	.41
Within Groups	273.30	87	3.14		
Total	278.90	89			

*Statistically significant at .05

Table 3 reveals that the average innovation scores of the three groups of learners did not differ significantly from each other (n=60).

Aspect	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.96	2	.48	.13	.88
Within Groups	322.70	87	3.71		
Total	323.66	89			

*Statistically significant at .05

Table 4 displays that the pre-learning scores of high-achieving learners are positively correlated with post-learning scores at a moderate level (r = .46, p = .01) (n=60).

Correlation							
		High-achieving learners		Intermediate-achieving learners		Low-achieving learners	
		Pre	Post	Pre	Post	Pre	Post
Pre-learning	Pearson Correlation	1	.46**	1	.20	1	-.35
	Sig. (2-tailed)		.01		.29		.06
	n	20	20	20	20	20	20
Post-learning	Pearson Correlation	.46**	1	.20	1	-.35	1
	Sig. (2-tailed)	.01		.29		.06	
	n	20	20	20	20	20	20

Table 5 indicates that the pre-learning knowledge scores are positively correlated with post-learning scores at a moderate level (r = .49, p = .00) (n=60).

Correlation					
Aspects		Pre-learning knowledge	Post-learning knowledge	Skills	Innovation
Pre-learning knowledge	Pearson Correlation	1	.49**	.15	.04
	Sig. (2-tailed)		.00	.16	.68
	n	60	60	60	60
Post-learning knowledge	Pearson Correlation	.49**	1	.13	-.05
	Sig. (2-tailed)	.00		.21	.64
	n	60	60	60	60
Skills	Pearson Correlation	.15	.13	1	.37**
	Sig. (2-tailed)	.16	.21		.00
	n	60	60	60	60
Innovation	Pearson Correlation	.04	-.05	.37**	1
	Sig. (2-tailed)	.68	.63	.00	
	n	60	60	60	60

Table 6 presents the mean and standard deviation of pre-learning and post-learning scores in knowledge, skill, and innovation aspects among learners.

Scores	Number	High-achieving group		Intermediate-achieving group		Low-achieving group	
		M	SD	M	SD	M	SD
Pre-learning knowledge	20	11.40	.90	7.17	.75	3.37	.56

Post-learning knowledge	20	14.97	2.44	12.77	2.36	12.13	1.83
Skills	20	20.37	1.27	19.97	2.22	19.77	1.70
Innovation	20	19.77	1.81	19.73	2.10	19.53	1.85

*Learners lacked skills and innovation prior to the course, hence their pre-learning values could not be measured.

VI. Conclusion

The results of utilizing the blended learning approach combined with active learning methods to enhance the technological and communication competencies of nursing students are as follows

1. Comparison of Learners' Scores with Blended Learning and Active Learning Approach

1.1 Knowledge Domain. Among the 60 nursing students, the average pre-learning score was 7.31 points, while the average post-learning score increased to 13.29 points. The comparison between pre-learning and post-learning scores revealed a statistically significant increase in post-learning scores at a significance level of .05. This result is consistent with the hypothesis and indicates that the implementation of the blended learning approach with active learning methods effectively improved the students' knowledge. Therefore, after the learning process concluded, the examination scores reflected a significant increase, with a post-learning average of 5.98, aligning with related research on blended teaching methods (Supakorn Fongjangwang, 2017). Post-learning scores were significantly higher than pre-learning scores at the .01 level but did not exceed the 75% benchmark, reaching significance at the .05 level.[12] The effectiveness of learning before the course was low, with a mean of 2.43, while the effectiveness after the course was high, with a mean of 3.81. This improvement is attributed to the positive attitude towards self-directed learning that students developed through the blended learning approach.[13]

1.2 Skills and Innovation Domain. Categorizing the technological and communication competencies of learners based on their proficiency levels, there was no significant difference observed. This finding does not align with the hypothesized expectation. This can be attributed to the fact that categorizing learners' technological and communication competencies involves assessing their knowledge level, while assessing skills requires practical application on the part of the learners. Additionally, assessing innovation abilities necessitates students to develop their own innovations after completing the learning process. Learners who were categorized into different proficiency levels in terms of technological and communication competencies all had equal opportunities to practice skills and develop innovations. This equivalence is embedded within the blended learning approach with active learning methods, resulting in non-differentiated learning outcomes. This result is consistent with research that explores the relationship between technological and communication competency utilization [14], which suggests that the comparison of learner groups does not yield statistically significant differences.[15] This could be attributed to the fact that technological and communication competencies can be developed through the flexible nature of technology, allowing learning to occur anytime, anywhere, and for anyone [16]. Given these reasons, even though learners varied in their levels of technological and communication competencies, they all have the capability to self-develop skills and competencies in technology and communication. This phenomenon leads to non-differentiated outcomes in the comparison.

2. Effects of Investigating the Relationship Levels Between Learners' Technological and Communication Competencies and Knowledge, Skills, and Innovation Domains Before and After Blended Learning with Active Learning Methods

2.1 Effects of Investigating the Relationship Levels Between Learners' Technological and Communication Competencies and Knowledge Before and After Blended Learning with Active Learning Methods: When examining the relationship levels between learners' technological and communication competencies and their knowledge before and after blended learning with active learning methods, it was found that proficient-level learners had a positive correlation between their pre-learning and post-learning knowledge scores. The correlation coefficient (r) was 0.46, signifying a significant positive relationship at the .01 significance level in the same direction, as hypothesized. This implies that proficient-level learners, when tested before and after learning, exhibited a consistent pattern where higher pre-learning scores corresponded to higher post-learning scores. This correlation signifies the reliability of developing knowledge among the proficient-level learner group, as it suggests that the same individuals who performed well initially also performed well after learning.

This aligns with research that employed Pearson's correlation coefficient in a similar context of pre- and post-learning comparisons.[17] For instance, it was found that the pre-learning exam scores were positively correlated with the learning outcomes of second-year students ($r = .32$, $p < .05$) and third-year students ($r = .49$, $p < .01$).[18] Additionally, the correlation between the first and second exam scores was even stronger ($r = .64$, $p < .01$), possibly due to the fact that the research outcome relies on the interplay between initial knowledge levels and the subsequent learning development after retesting.

2.2 Relationship Between Pre-Learning Knowledge and Post-Learning Knowledge: The pre-learning knowledge is correlated with the post-learning knowledge, with a correlation coefficient (r) of 0.49 (for all groups), indicating a significant positive relationship at the .01 significance level in the same direction, at a moderate level. This implies that the pre-learning knowledge level of learners is predictive of their post-learning knowledge score, suggesting that regardless of their initial knowledge level, learners exhibit an increase in knowledge after blended learning with active learning methods.

Relationship Between Pre-Learning Skills and Innovation Scores. The pre-learning skills scores are correlated with the innovation scores, with a correlation coefficient (r) of 0.37 (for all groups), indicating a significant positive relationship at the .01 significance level in the same direction, at a moderate level. This implies that the skills learners possess prior to learning are related to their subsequent innovation scores.

Interrelated Correlations. There are two pairs of interrelated correlations observed. 1) between pre-learning and post-learning knowledge scores, and 2) between skills and innovation scores. The correlation between pre-learning and post-learning knowledge scores suggests that the pre-learning knowledge level predicts a moderate increase in post-learning knowledge scores. This is attributed to the blended learning approach with active learning methods, aiming to develop learners' technological competencies from their existing knowledge base to higher levels. Similarly, the correlation between skills and innovation scores is due to the practical training provided during the blended learning process, which leads to the mastery of skills necessary for innovation. Consequently, the practical training scores correlate with the innovation scores, reinforcing the idea that effective practical training can lead to innovative skills development.

Dissimilar Correlations.[19] Conversely, there are several instances of correlations that are not statistically significant: 1) pre-learning knowledge and skills, 2) pre-learning knowledge and innovation, 3) post-learning knowledge and skills, and 4) innovation and skills. This suggests that technological and communication competencies in all four domains do not correlate significantly with each other, thus having no direct impact on learners. These findings deviate from the hypothesis and are consistent with research that uses Pearson's correlation coefficient in similar contexts, illustrating a lack of significant relationships between various domains,[20] such as the non-significant correlation between high school students' GPA and university students' GPA (r = 0.55),[21] and the lack of significant relationship between two course scores of students (r = 0.0).

These non-significant correlations might be due to the different nature of variables being compared, resulting in the absence of meaningful connections between different domains' scores.

Recommendations for Research Development to Enhance Technological and Communication Competencies among Learners. 1) Learner Empowerment through Blended and Active Learning: Learners can develop technological and communication competencies in terms of knowledge, skills, and innovation through a blended learning approach coupled with active learning methods. Learners actively engage in the classroom by taking action, receiving input from instructors or peers for rapid feedback, and independently solving problems. This fosters the development of advanced thinking skills, including analysis, synthesis, and application, using ICT skills to research information, text, images, videos, articles, and research works. This is achieved through practical exercises and various assessments that enable learners to create valuable knowledge and apply it effectively in their daily lives. 2) Instructor-Led Blended Learning Approach: Instructors can employ a blended learning approach with active learning methods to facilitate teaching and learning. Instructors manage both offline learning (Face to Face) and online learning (Learning Management System) equally, with a distribution of 50% each. A diverse range of teaching tools and methods is utilized, such as creating interactive classroom experiences, receiving rapid feedback for reflective thinking, and fostering a creative atmosphere through collaborative learning activities. This approach enhances the teaching process, reduces preparation time, and optimizes existing educational technology to achieve the highest benefits in teaching and learning.

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