Kasetsart Journal of Social Sciences

The development of self-learning in the new normal education with online learning to enhance information and communication technology competency of pre-service teachers at the undergraduate level

Uraiwan Srichailard

Department of Computer Education, Faculty of Science and Technology, Nakhon Pathom Rajabhat University, Nakhon Pathom 73000, Thailand

Article Info

Abstract

The objectives of this research were: (1) to develop and determine the appropriateness of self-learning in the New Normal Education with online learning to enhance information and communications technology competency of pre-service teachers at the undergraduate level; (2) to study the effectiveness of the developed self-learning model; (3) to measure information and communication technology competency of pre-service teachers at the undergraduate level, and (4) to compare the academic achievement of the pre-service teachers from the test scores before and after learning. This research is based on a research and development model. The sample group was pre-service teachers, comprised of 30 people, and enrolled in the course 21st Century Skills for Life and Career in the second semester of the academic year 2021 at Nakhon Pathom Rajabhat University. A clustered simple random sampling method was used. Research data were analyzed by mean, standard deviation, percentage, and statistical test by *t*-test. The results of the research revealed that (1) the developed self-learning model consists of the following components: (1.1) Input (learners, teachers), (1.2) Process, namely, Online Learning Module, and (1.3) Output, namely, Project Module and Evaluation Module. Appropriate evaluation by experts is at the highest level; (2) Efficiency of the developed self-learning model was equal to 83.64/82.80; (3) Information and communications technology competency of pre-service teachers was at a very good level; and (4) post-learning achievement was higher than before at the statistically significant level of .05.

© 2024 Kasetsart University.

E-mail address: uraiwannat@webmail.npru.ac.th.

Introduction

Teaching in the field of education is one of the famous professions at Nakhon Pathom Rajabhat University. In teaching and learning management in the teaching profession, specific professions have been separated to provide teaching and learning for expertise and skills in a specific field. There is a course that students of all teaching professions must study, and part of the study is to train students to become knowledgeable and experts in the use of information and communication technology for future use, for teaching practice, or a career in their professional field to be effective.

Due to the changing times, technology is inevitable for all teachers. For example, from the current situation with the coronavirus outbreak, teachers have to learn more about using technology. The researcher studied research articles that reflected the problems of teachers both domestically and internationally regarding the necessity, knowledge, and competency of using information and communication technology (ICT), such as a research article by (Pheeraphan & Suwathanpornkul, 2018) stating that the results from the study of the essential needs regarding competencies for ICT of more than 1,000 teachers found that most of the knowledge and competencies that teachers needed and saw as the priority were: (1) using ICT to stimulate and apply learning management to suit students; (2) the use of ICT as a tool to monitor and assess the progress of individual learners; (3) the deployment of assistive technologies to support participation in learning of learners with disabilities; (4) the use of ICT to plan and prioritize learning, lesson design, assessment, and reporting; (5) the use of ICT in planning, selection, and learning sequences to support teaching; (6) the use of ICT in activities that enable learners to face problems and situations. A research article by Mafang'ha (2016) stated that the benefits of using ICT to facilitate teaching are individual interaction, and integration with resources; however, there were some factors that make teachers' use of ICT inefficient such as teacher's attitude, teachers' ability to use ICT and access to ICT facilities, professional development, and availability of technical support. Indeed, a research article by (Subaveerapandiyan & Nandhakumar, 2021) stated that due to the age availability of resources from studies and research, it could be concluded that ICT is extremely necessary for personnel in the teaching profession whether it is for teaching or even for managing the resources of the organization.

The problem of the coronavirus epidemic in 2020, caused impacts in every aspect, including the education system (Suwannoi, 2020). As a result of this effect, the education system around the World has undergone a sudden change. The method of teaching must be changed from the old way to a new way using the media of technology as a tool. This has created a new definition of education, such as Education in the New Normal Era or The New Normal Education. It is with the New Normal that learners have more channels and areas of learning. Greater use of one's learning potential under self-discipline, caused teachers to learn and adapt to the new way of life (Tongkeo, 2020). The impact of the COVID-19 epidemic on education in terms of teaching and learning is the heart of learning for learners. The COVID-19 crisis has given us an opportunity to create new concepts in learning or teaching with new innovative methods. There is an online teaching system combined with other learning materials Siritharo (2021). In the New Normal Education, teachers should design teaching and learning styles to meet the needs of learners or be suitable for the readiness and resources of the learners to be able to apply the knowledge for self-development.

There are many methods for learning management, but which method is suitable for changes in the New Normal Education that occurred in the Covid-19 era, Office of the permanent secretary, Ministry of education (2018)? According to an academic article by the Office of the Permanent Secretary, Ministry of Education, it said that the concept of self-learning is likely to be a crucial concept in adult education in the future. In addition, it is expected to be a powerful concept that drives great progress in adult education. In successful self-learning, the facilitator must have a co-mental role, exchange ideas as a source of knowledge as the learners need, have a good relationship with learners, participate in the transfer of teaching roles, and encourage learners to think critically by relying on online lessons to promote a self-learning style.

Online lessons are a learning style that occurs in response to distance learning. Such is computer teaching media designed and developed efficiently to be used to present knowledge content in the form of multimedia (Srichailard et al., 2019). From the experimental method of teaching the classroom inverted for computer education learners at Nakhon Pathom Rajabhat University, all 96 learners were most satisfied with learning using video media to help provide content. Such is a learning medium that is suitable for learners.

Nakhon Pathom Rajabhat University adopted a policy of transitioning to online learning during the coronavirus epidemic, which is considered a novel approach for the university. This shift represents a new paradigm in educational management, embracing innovative methods to ensure the continuity of learning in the face of the coronavirus outbreak. In the actual implementation of online learning, there are several challenges and obstacles that educators need to address to ensure successful and effective teaching in each subject. These challenges include students' readiness with the necessary equipment, reliable internet connectivity, classroom management in the online setting, content delivery, and assessment methods. As a result, instructors must research and explore various strategies to achieve the highest level of success and efficiency in each subject's teaching and learning process. Due to the importance and origin of the problems mentioned above, the researcher had an idea to develop self-learning in the New Normal Education with online learning to enhance the information and communication technology competency of the pre-service teachers at the undergraduate level and to be an alternative way to teach learners to gain knowledge and ability in information and communication technology. Such encourages learners to become quality graduates in the future.

Literature Review

Self-Learning

Anuphap (2017) concluded that self-directed learning was a process that ensured lifelong continuing education. And, it was a crucial concept of human resource development because it was an important skill and way of life for human survival in a changing World, doing the research and having study skills to be self-reliant. Ryan and Deci (2000) concluded that at a fundamental level, human beings seek satisfaction from three psychological needs: competence, autonomy, and relatedness, which are applicable to undergraduate students across all academic disciplines, including those pursuing a career in teaching.

The New Normal Education

Wongyai and Patphol (2020) stated in Learning design in the New Normal era meant learning design that allowed learners to set learning goals, how to learn,

and self-assessments in order to be able to apply the knowledge for self-development. This learning differed from the traditional learning design in which the instructor set the goals and learning methods for the learners Setkhumbong (2022), also stating that the New Normal of the learning environment was online teaching and learning that took advantage of the potential of digital technology, had changed the perception and understanding of students and teachers, resulted in more clear learning about online teaching.

Online Learning

Yongphot (2018) stated that online learning was teaching and learning through websites through e-learning systems using management technology in the form of a Learning Management System (LMS), a learning management system that is software that manages to teach and learn through the web. Insaard (2018), stated that online learning was the use of electronic media, both in online and offline formats, serving as a medium to transmit knowledge and facilitate learning for students. In online teaching, technology and internet communication are utilized as channels to deliver content, which can also be integrated with traditional classroom teaching. Based on a survey of various universities in Thailand, it is evident that many institutions incorporate e-learning as supplementary materials. Educators use it as an alternative to engage students actively, making learning in the classroom more dynamic and enjoyable. This approach aims to provide additional experiential knowledge and enhance students' learning experiences through activities, assignments, and homework.

Information and Communication Technology

Information and Communication Technology (ICT) Competency stated that teacher development in the use of ICT for learning management has five competencies, as shown follows: Competency 1 is Basic ICT. There are six components: (1) Computer usage and hardware, software, and network system; (2) Internet usage, network system resources on the Internet; (3) Use of office programs in work and graphic programs; (4) Hardware and software purchase, basic troubleshooting, and maintenance; (5) Handling information about confidentiality and security; and (6) Basic skills in everyday life such as literacy skills, problem-solving, calculation, and analysis skills. Competency 2 is ICT for communication. There are four components:

(1) Using web browsers (Web Browser) and searching for information (Search Engine) on the Internet; (2) Using electronic mail (E-mail); (3) Using tutorial software (Tutorial Software) and exercise programs (Drill and Practice Software); (4) The use of tools to create multimedia information to create messages together via a network or Social Network. Competency 3 is ICT Literacy. There are six components: (1) Using a search engine online database and other resources to search for and retrieve information; (2) Compliance with policies, rules, etiquette, and regulations regarding Internet use; (3) Interpretation and the ability to analyze the meaning of the media and display the results; (4) Evaluation of data usage and management of information, assess the correctness and synthesis of information obtained from the Internet; (5) The ability to produce creative media, design online lessons, and apply information effectively; and (6) Using digital ICT in communication, and networking, including access to social media, and to promote working with students and colleagues appropriately. Competency 4 is ICT integration competency in teaching and learning. There are five components: (1) The use of Basic ICT and network systems; (2) The use of ICT to support thinking and creativity skills; (3) The use of ICT in teaching and learning for measurement and evaluation; (4) The use of ICT in teaching and learning for professional development; and (5) The ethics in using ICT consist of 5 elements: (1) The use of ICT and communication legally, morality and ethics; (2) Being a model for the use of ICT correctly and safely; (3) Use ICT to facilitate learning of socially and culturally diverse learners responsibly; (4) Know the use of information and copyrights; and (5) Participate in the dissemination of copyright law and intellectual property (Choositong et al., 2020).

Learning Styles

Khammanee (2013), stated that the educational landscape encompasses a well-structured learning and teaching framework, guided by diverse philosophies, theories, principles, ideas, and beliefs. This comprehensive approach includes vital processes or steps in the teaching and learning journey, along with various teaching methods and techniques. The underlying principles or concepts must undergo scrutiny, testing, and acceptance to ascertain their effectiveness and suitability for instructional planning.

Methodology

The development of self-learning in the new normal education with online learning to enhance information and communication technology competency of pre-service teachers at the undergraduate level used a quasi-experimental one-group, pretest-posttest design.

Participants

The participants were pre-service teachers comprised of 30 people and enrolled in the course 21st Century Skills for Life and Career (course code 4000102) in the second semester of the academic year 2021 in Nakhon Pathom Rajabhat University and not a professional field of computer education teachers, chosen using a clustered simple random sampling method. Step 1: The total number of students is 311, divided into 14 classes. Step 2: To create a random sample, we draw lots that specify the names of the sample groups and the number of groups to be selected.

Data Collection

Creation of research tools to develop self-learning in the New Normal Education with online learning to enhance information and communication technology competency of pre-service teachers at the undergraduate level. This research is based on a research and development model and proceeds according to the conceptual ADDIE Model process (Morrison, 2010). The details are as follows.

Step 1 Analysis: At this stage, the researcher studied and analyzed the basic information needed to be used as a guideline for developing self-learning in the New Normal Education with online learning to enhance information and communication technology competency of pre-service teachers at the undergraduate level: (1) Study and analyze information about learning to use information and communication technology of pre-service teachers at the undergraduate level, including courses, course descriptions, and important skills of learners; (2) Survey data from 10 people of instructors in computer education using a questionnaire. The results obtained were as follows: subjects used in teaching and learning, learning objectives, content used in learning management, measurement and evaluation methods, and the importance of using information and communication technology of pre-service teachers; (3) Survey data from 106 people of pre-service teachers at

Nakhon Pathom Rajabhat University using a questionnaire. The results obtained were as follows: the needs of learning management on the use of information and communication technology of pre-service teachers and content used in learning management; and (4) Competencies of knowing information and communication technologies and lessons used in the development of self-learning in the New Normal Education with online learning to enhance information and communications technology competency of pre-service teachers at the undergraduate level consisting of: (1) skills in using office programs in work; (2) skills in using a variety of media to create workpieces for students to allocate and analyze various information; (3) Skills in using media that has openness and having the flexibility to create a learning environment by using a variety of technologies to support interaction between learners; and (4) skills in using information and communication technology to assess the teaching and learning process and using the assessment results to improve and design learning activities; with a self-learning model and the concept of learning in a New Normal Education.

Step 2 Design: In this step, the researcher designed the components of developing self-learning in the New Normal Education with online learning to enhance the information and communication technology competency of pre-service teachers at the undergraduate level. The details are as follows: (1) Self-learning in the New Normal Education with online learning to enhance information and communication technology competency of pre-service teachers at the undergraduate level. Use the data obtained from the analysis to design a self-learning model in the New Normal Education with online learning to enhance the information and communication technology competency of pre-service teachers at the undergraduate level. Create a learning style assessment form to cover the specified scope, namely, components of learning model, the process of learning management according to the learning model, measurement and evaluation, results of using the learning model, and other suggestions, and bring the assessment form to the experts to evaluate the value of the index of item objective congruence; (2) Learning Lesson Plan. Create a total of 10 learning lesson plans consisting of course descriptions, course objectives, and groups of students, analyzed work development plans, teaching projects, work analysis tables, behavior objectives, content sheets, quizzes, worksheets, workflow activity sheets. Create a test of 65 items. Create ten sets of work orders; and (3) Self-learning management system in the New Normal Education with online learning to

enhance information and communication technology competency of pre-service teachers at the undergraduate level. Design a learning management system and create a system layout. Screen layouts are the arrangements of the screen space for displaying text, images, model, colors, and font sizes. Design online lessons and create storyboards. Screen layouts were the management of the screen space for displaying text, images, model, colors, and font sizes.

Step 3 Development: (1) Create a self-learning learning model in the New Normal Education with online learning to enhance the information and communication technology competency of pre-service teachers at the undergraduate level; (2) Present the synthesis of learning model to experts to find the appropriateness of the learning model. After evaluating, the experts provided valuable feedback regarding the steps of the New-ESelf Learning Model. To enhance future implementation, the researchers will present the steps in a more detailed manner, accompanied by concise and easily understandable explanations. This will facilitate its future practical application and ensure its effectiveness in the learning process; (3) Develop a learning management system and online lessons as designed. Once completed, presented to five experts to assess the quality of the learning management system by using the Blackbox Testing method; and (4) Develop online lessons as designed. Once completed, presented to five experts to assess the quality of online learning.

Step 4 Implementation: At this stage, the researcher used the developed learning style to experiment with the sample group in a single experiment of three people, and a group experiment of six people. After implementation, the researcher used the acquired data to correct any deficiencies and complete improvements. It could be concluded that the developed model was efficient and could be used for further experiments.

Step 5 Evaluation: The researcher uses the learning model through quality and efficiency evaluation to collect data with the 30 participants to compare academic achievement before and after learning by using the learning model to measure information and communication technology competency.

Data Analysis

Finding mean and standard deviation to analyze the quality of the learning style model, information and communication technology competency. Individual learning effectiveness was examined by comparing the average scores of pre-test and post-test assessments, utilizing a *t*-test with a significance level of .05

Results

1. The results of developing a self-learning model in the New Normal Education with online learning to enhance information and communications technology competency of pre-service teachers at the undergraduate level. The researcher studied documents, theories, and various research, including methods of teaching and learning management. Figure 1, shows the learning model which is named the New-ESelf Learning Model.

Principle

(1) It is an organization of the teaching and learning process through the Internet in the new educational era; (2) Teachers are responsible for analyzing learning needs and supporting learning; and (3) Learners are responsible for self-study and self-assessment.

The learning management process in the form of a New-ESelf learning Model consists of Input, Process, and Output, consisting of the following components:

1) Input consists of learners and teachers.

- Learners must log in to the teaching and learning management system and study according to the process.

- Instructors must enter the teaching and learning management system and manage the provision of content, quizzes, workpieces, and learner management.

2) Process is a self-learning process in a New Normal Education with online lessons through online learning modules. Self-Direct & New Normal Education is a learning process consisting of 4 steps: Step 1 Explain. Setting goals and tasks, Step 2 Plan and Activity Plan.

Planning for learning and doing activities to achieve the specified goals, Step 3 Study to plan and research. Study according to the specified plan. It is a study to understand knowledge, along with self-learning, and Step 4 Create a Product, bringing the knowledge gained from self-learning to create workpieces according to the specified workload. Online Tools for Education is a tool to support online learning management.

3) Output is the learner's process of creating and submitting workpieces into the learning system and evaluating using Evaluation (Rubric). There are three evaluation criteria, namely: (1) Holistic Rubric, (2) Analytic Rubric, and (3) terms of attitude.

2. The results of the evaluation of the appropriateness of the learning style from 10 experts created by the researcher found that the average score was at the highest level ($\bar{x} = 4.89$, $SD = 0.31$) to enhance the information and communications technology competency of pre-service teachers at the undergraduate level, this result was suitable to be used further.

The results of studying the effectiveness of the self-learning model in a New Normal Education with online learning came from the learning management process, where 30 learners took tests during the learning process and tests after class. The data were analyzed for statistical values, as shown in Table 1.

Table 1 The result of studying the effectiveness of the self-learning model in a New Normal Education with online learning

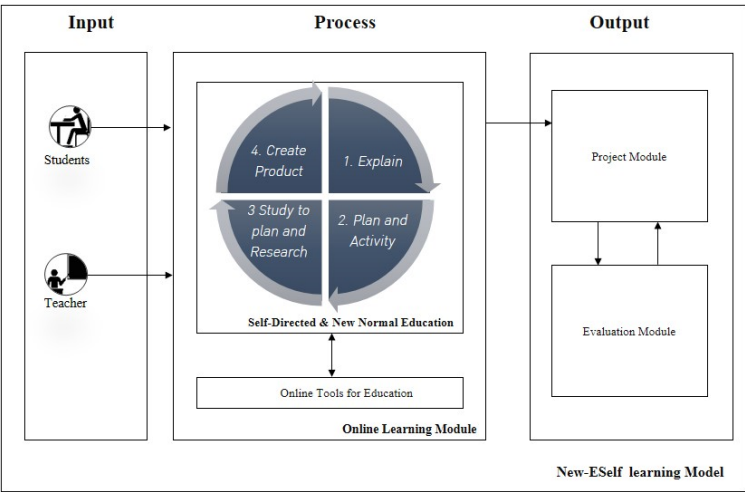| Test score	n	Score	Total Score	Effectiveness
Score of mid - test (E1)	30	65	1631	83.64
Score of post - test (E2)	30	50	1242	82.80

Figure 1 Self-learning in the new normal education with online learning to enhance information and communication technology competency (New-ESelf Learning Model)

From Table 1, the developed self-learning model in a New Normal Education (New-ESelf learning Model) had an efficiency of 83.64/82.80, meeting the specified criteria of 80/80. Thus, it could be concluded that the developed learning style is effective.

3. The results of measuring information and communication technology competency and the process of measuring information and communication technology competency of pre-service teachers at the undergraduate level with 30 people from the sample group assigned to complete ten worksheets and measuring scores according to the Rubric Score criterion. The data were analyzed for statistical values, as shown in Table 2.

From Table 2, the process of measuring information and communication technology competency of pre-service teachers at the undergraduate level, it was found that learners' average scores in each of the four skills were at a very good level. The highest average score of the four skills was Skills in using information and communication technology to assess the teaching and learning process and using the assessment results to improve and design learning activities ($\bar{x}$ = 4.67, *SD* = 0.40).

4. To compare the academic achievement from the test scores before and after learning.

In the comparison of learning achievement from pre-test and post-test scores of learners, the researcher had the experimental group of 30 people take the test one time before learning and one time after learning, and the data were analyzed for statistical value, as shown in Table 3.

Table 3 shows the learning achievement of the learners who studied with the self-learning model in a new normal education with online learning to enhance information and communications technology competency of pre-service teachers at the undergraduate level. Students took the test one time before learning then learned through online lessons via the website

https://www.nselfeducation.lmsforlearn.com, following the steps of the New-ESelf learning Model. The process involves: Setting objectives and tasks, with the website providing prepared lessons and assignments. Planning their learning journey and engaging in activities to achieve the set goals. Learning according to the designated plan through online lessons. Creating and submitting their works based on the assigned tasks. Upon completion of the learning process, learning achievement after learning ($\bar{x}$ = 41.40, *SD* = 3.25) was higher than before learning ($\bar{x}$ = 28.73, *SD* = 4.90) at statistical significance at the .05 level.

Results and Discussion

1. The researcher developed and found the appropriateness of self-learning in the New Normal Education with online learning to enhance information and communication technology competency of pre-service teachers at the undergraduate level by using the learning model called the New-ESelf learning Model. It consists of the following components: (1) Input (Students, Instructors); (2) Process consists of an online learning module. The module manages to teach and learn with an online learning system that operates in self-learning in the New Normal Education. There are four steps as follows: Step 1 Explain. Step 2 Plan and Activity Plan. Step 3 Study to plan and research and step 4 Create a Product, bringing the knowledge gained from self-learning to create workpieces according to the specified workload; and (3) Output is the learner's process of creating and submitting workpieces into the learning system and evaluating using Evaluation (Rubric). There are three evaluation criteria, namely, the evaluation process consists of 3 parts: (1) Holistic Rubric, (2) Analytic Rubric, and (3) Terms of attitude.

Table 2 The result of measuring information and communication technology competency

Assessment skills	$\bar{x}$	SD	Skill level
1. Skills in using office programs in work	4.50	0.60	Very good
2. Skills in using a variety of media to create workpieces for learners to allocate and analyze various information	4.63	0.43	Very good
3. Skills in using media that has openness and having the flexibility to create a learning environment by using a variety of technologies to support interaction between learners	4.51	0.47	Very good
4. Skills in using information and communication technology to assess the teaching and learning process and using the assessment results to improve and design learning activities	4.67	0.40	Very good

Table 3 The results of comparison of learners' performance before and after receiving treatment.

Test score	n	Total Score	$\bar{x}$	SD	t	df
Pre-Test	30	50	28.73	4.90	12.86*	29
Post-Test	30	50	41.40	3.25		

The learning was developed and was taken to 10 experts to assess the appropriateness of the learning style. The evaluation result had the highest mean score ($\bar{x}$ = 4.89, *SD* = 0.31). The researcher studied theories, documents, and relevant research for analyzing and designing learning model that could be used in teaching and learning. The researcher developed a learning model according to Morrison, ADDIE Model learning process. It is the development of a teaching and learning model that relies on a systematic approach that helps teaching and learning to be effective and is very appropriate. It consists of the following steps: (1) Analyze, (2) Design, (3) Develop, (4) Implement, and (5) Evaluate process.

2. The efficiency value of self-learning in the New Normal Education with online learning found that was equal to 83.64/82.80 according to the specified criteria (80/80). It was because the researcher created a test to be used with a self-learning model in a New Normal Education with online learning to enhance information and communications technology competency of pre-service teachers at the undergraduate level accurately and completely in every process according to the concept of the ADDIE Model. The use of learning model, media, and technology prompted learners to be familiar with online learning, causing the learners to feel fond of learning. In terms of taking the test during the online learning, the score was higher than after the online learning because when the online learning finished, the learners took the test immediately, namely, do not leave it too long. Thus, it may result in getting a good score as well, agreeing with the research by Koeipudsa (2018) titled the development of a RAJASEE learning management model to enhance the problem-solving abilities of Mathayomsuksa 4 students at Ratchasima Wittayalai School. Such is an experimental learning management model found to be effective 85.11/84.3. The process of measuring information and communication technology competency of pre-service teachers at the undergraduate level showed learners' average scores in each of the four skills were at a very good level.

3. The results of measuring information and communication technology competency of pre-service teachers at the undergraduate level after learning with a developed learning style showed that the learners' average scores in each of the four skills were at a very good level. They were ranked in order of average as follows: (1) Skills in using office programs at work were at a very good level ($\bar{x}$ = 4.50, *SD* = 0.60); (2) Skills in using a variety of media to create workpieces for learners to allocate and analyze various information

were at a very good level ($\bar{x}$ = 4.63, *SD* = 0.43); (3) Skills in using media that have an openness and having the flexibility to create a learning environment by using a variety of technologies to support interaction between learners were at a very good level ($\bar{x}$ = 4.51, *SD* = 0.47); and (4) Skills in using information and communication technology to assess the teaching and learning process and using the assessment results to improve and design learning activities were at a very good level ($\bar{x}$ = 4.67, *SD* = 0.40). The researcher created a worksheet and score criteria for measuring information and communication technology competencies according to academic principles. Worksheets and measurement criteria were presented for experts to assess their suitability and update them until they could be used. The learners used the self-learning model in a New Normal Education with online learning, in which students could plan their studies and go back or revisit the online lessons that demonstrate the use of information and communication technology in each lesson as desired by the learners. This is consistent with the research by Thepchak et al. (2018) titled enhancing grade 11th students' effective communication skill through socioscientific issues learning management integrated with the scientific argument on the topic of plant growth. The average scores after learning that were obtained from the Effective communication skills test, and the average score from worksheets while participating in the activity were compared with the level of Effective communication skills. The results showed that the level of Effective communication skills was at a very good level.

4. The learners' learning achievement after learning with a developed self-learning style ($\bar{x}$ = 41.40, *SD* = 3.25) was higher than before learning ($\bar{x}$ = 28.73, *SD* = 4.90) at a statistical significance level of .05. The researcher analyzed the content, designed and developed according to the process. Learning model and lessons are assessed for quality by experts and revised based on recommendations to make them applicable. Learning management has comprehensive components, including course descriptions, course objectives, groups of students, analyzed work development plans, teaching projects, work analysis tables, behavior objectives, content sheets, quizzes, worksheets, and workflow activity sheets. Students could set their own learning guidelines according to the developed learning style until leading to higher academic achievement, which was consistent with the research by (Chanthra et al., 2021) titled Development of learning management model for enhancing

the media production skills. The comparison of the learning achievement of learners before and after learning showed the pre-learning mean score was 15.32, the standard deviation was 2.50, the post-learning mean score was 24.34, and the standard deviation was 1.36.

Conclusion and Recommendation

The results from this research were obtained by using the learning model called New-ESelf learning Model reviewed by experts. It is an online learning, consisting of four learning steps as follows: Step 1 Explain, Step 2 Plan and Activity Plan, Step 3 Study to plan and research, Step 4 Create a product. Information and communication technology competency of pre-service teachers at the undergraduate level after learning with the developed self-learning style was at a very good level in all four skills, and the learning achievement of the learners who studied with the developed self-learning style had significant higher academic achievement at the .05 level.

Recommendations

1. For those who are interested, the learning model from this research may be applied for teaching and learning among learners who would like to develop their information and communication technology competency. To meet the needs of both learners and instructors, the online lessons are created to present information through convenient channels. The learning process follows the New-ESelf learning Model, comprising four steps as discussed earlier:

2. Further research may lead to further development of the learning model to measure competencies or enhance learning in other areas.

Conflict of Interest

The author declares that there is no conflict of interest.

References

Anuphap, K. (2017). *Self-directed learning for learning development in computer subject of prathomsuksa 4 students* [Master's thesis, Education, Dhurakij Pundit University]. https://doi.org/10.14458/DPU.the.2017.1

https://li01.tci-thaijo.org/index.php/crujournal/article/view/160340/117446 https://so04.tci-thaijo.org/index.php/neuarj/article/view/242756/166603 Chanthra, R., Whattananarong, K., & Satienchaiyakij, P. (2021). Development of learning management model for enhancing the media production skills. *Rajapak Journal*, *15*(42), 301–317. https://so05.tci-thaijo.org/index.php/RJPJ/article/view/253065/171955

Choositong, I. Pawabutra, C., & Suwannatrai, W. (2020). Model for teachers' development in using information technology and communication for learning activities in primary Schools under regional education office No.11. *NEU academic and research journal*, *10*(2), 98–112. https://so04.tci-thaijo.org/index.php/neuarj/article/view/242756/166603

Insaard, S. (2018). *Designing e-learning lessons to enhance higher-order thinking skills*. Se-education.

Koeipudsa, C. (2018). The development of RAJASEE instructional model to enhance thinking abilities for problem solving of grade 10 students, at Ratchasima Witthayalai School. *Journal of Chandrakasemsarn*, *24*(47), 64–78. https://li01.tci-thaijo.org/index.php/crujournal/article/view/160340/117446

Khammanee, T. (2013). *Pedagogy: Organizing knowledge for effective learning processes* (7th ed.). Darn sutha.

Mafang'ha, M. (2016). *Teachers' experience on the use of ICT to facilitate teaching: A case of ilala district secondary schools*. [Master's thesis, Education in Administration]. http://repository.out.ac.tz/1584/

Morrison, G. R., (2010). *Designing effective instruction* (6th ed.). John Wiley & Sons.

Office of the permanent secretary, Ministry of education. (2018). *Self-directed learning*. http://www.ops.moe.go.th/ops2017

Pheeraphan1, N., & Suwathanpornkul, I. (2018). Development of assessment tool on information and communication technology competencies needed in instruction for teachers in the 21st century. *Academic Journal of Education*, *19*(1), 244–260. https://ejournals.swu.ac.th/index.php/jedu/article/view/10611/8821

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*, 68–78. http://dx.doi.org/10.1037/0003-066X.55.1.68

Setkhumbong, T. (2022). Changing the learning environment in higher education to the normal in the COVID-19 crisis situation. *Rajapak Journal*, *16*(4), 1–13. https://so05.tci-thaijo.org/index.php/RJPJ/article/view/254596/173484

Siritharo, P. C. (2021). The new normal in education. *Journal of Modern Learning Development*, *6*(6), 346–356. https://so06.tci-thaijo.org/index.php/jomld/article/view/250086/171283

Srichailard, U., Wannasawade, W., & Sinthanakul., K. (2019). A conceptual framework of a flipped classroom by project-based learning by analyzing of student's on David Kolb's learning styles. *Interdisciplinary Research Review*, *14*(5), 7–12. https://ph02.tci-thaijo.org/index.php/jtir/article/view/224963

Subaveerapandiyan, A., & Nandhakumar, R. (2021). A study of teacher educators' skill and ict integration in online teaching during the pandemic situation in India. *Library Philosophy and Practice (e journal)*, 5938. https://digitalcommons.unl.edu/libphilprac/5938/

Suwannoi, P. (2020). *Teaching design*. https://edu.rmu.ac.th/n2019/index.php/service-site/subj/doc-seminar/transitioning-to-the-new-normaleducation?format=html

Thepchak., W., Sawangmek., S., & Nakkuntod, M. (2018). Enhancing grade 11th students' effective communication skill through Socioscientific issues learning management integrated with scientific argument in topic of plant growth. *Academic services journal prince of songkla university*, *29*(3), 50–63. http://dx.doi.org/10.14456/asj-psu.2018.44

Tongkeo. T. (2020). New normal based design in education: Impact of COVID-19. *Journal of teacher professional development*, *1*(2), 1–10. https://ph02.tci-thaijo.org/index.php/withayajarnjournal/article/view/241830/164268

Wongyai, W., & Patphol, M. (2020). *Learning design in new normal.* Srinakarinwirot University.

Yongphot, K. (2018). *Development of online learning lessons of history based on constructivist theory for Mathayomsuksa 1 students at Khaokala Vittayakhom School.* [Master's thesis, Naresuan University]. http://www.edu.nu.ac.th/th/news/docs/download/2018_08_26_12_17_44.pdf