International Education Studies; Vol. 17, No. 3; 2024
ISSN 1913-9020 E-ISSN 1913-9039
Published by Canadian Center of Science and Education

Enhancing Pre-Service Teachers' Perspectives on Teaching and Learning Through the Development of E-Learning

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Received: June 12, 2023 Accepted: January 18, 2024 Online Published: May 29, 2024

doi:10.5539/ies.v17n3p84 URL: https://doi.org/10.5539/ies.v17n3p84

Abstract

This study aimed to develop e-learning for pre-service science teachers and investigate the effect of this e-learning on their attitudes toward learning and teaching. A mixed method was employed in this research. Participants were 22 pre-service science teachers at one public university in Thailand who enrolled in the Educational Psychology and Guidance for Teacher class in the first semester of 2020. The instruments used in this study were a questionnaire with 20 items to investigate participants' knowledge, understanding, and opinions toward the e-learning lessons. The data analysis by mean, standard deviation, relative gain score, and content analysis. The results indicated that the developed e-learning effectively increases pre-service science teachers' attitudes toward teaching and learning. The relative gain score of attitudes toward teaching and learning was 89.47, and the high satisfaction level towards e-learning (mean = 3.87). The findings show that participants reflected that e-learning lessons helped learners manage learning independently, learn from any place, and repeat learning to learn anytime. However, feedback highlighted areas for improvement, including the need for more engaging audio narration and detailed explanations in exercises of this e-learning because it was monotonous.

Keywords: e-Learning, pre-service science teachers, attitudes toward teaching and learning

1. Introduction

Attitudes affect a person's behavior in terms of being the cause of behavior, which can also cause attitude. People gain experience when they behave according to their thoughts and needs, turning an idea and some feelings into action (Wonganutarot, 2010). Attitudes are relatively enduring and broad assessments of an object, individual, group, topic, or idea, spanning a spectrum from negative to positive. They offer concise evaluations of target entities, and people frequently believe that they stem from particular beliefs, emotions, and past behaviors associated with those entities (VandenBos, 2015). Three components contribute to the formation and expression of attitudes which are (1) the affective component of attitudes, which indicates the feeling or emotions linked to an attitude object; (2) the cognitive component of attitudes, which refers to beliefs, thoughts, and attributes we associate with a particular object; and (3) the behavioral component of attitudes refers to past behaviors for an attitudes object (Haddock & Maio, 2008). Human development for good attitudes toward the teaching profession was essential to building motivation for learning. It also included having good academic behavior, especially in the teaching profession. This profession sacrificed physical and mental strength to develop learners of moral, ethical, and intellectual. Knowledge management and learning design suit the students to create opportunities for learners to learn in any situation, including organizing other activities in the school with a learner focus. (Faculty of Education Suratthani Rajabhat University, 2019) Consequently, it is essential to gain a positive attitude toward learning to improve the professionalism of pre-service teachers because they will be a quality model for creating a positive attitude toward learning for their students. As a result of the change in attitudes toward the teaching profession, this is part of the reason they give when describing or clarifying both good and bad behavior: they behave apparently and individually. It would be easy for people to change their attitude. However, humans are

considerate and attentive creatures, which do not quickly satisfy them. So, they could consider their satisfaction and dissatisfaction according to an appropriate situation or the situation that would occur in the future (Laosunthorn, 2006).

This study reflected that teachers with positive professional attitudes perform better in teaching and learning, are more professionally motivated, and are punctual in school. Furthermore, they respect their students and colleagues and participate enthusiastically in the school's academic activities. Moreover, it found that teachers with positive professional attitudes care about students, parents, and colleagues because they are passionate learners (Ahmad & Zeb, 2013).

Pre-service teacher students with professional experience in science teaching practicum reflected that some students were aggressive in the class. They needed to be more competent to endure students' negative behavior and have more confidence in coaching. It caused uneven coaching (Executive Committee of the Educational Experience Training Center, 2019). The negative experiences that came from students' reflections could affect the attitudes of the teaching profession. It was partly because of the change in attitudes and partly because of direct experience of it (Srisongkram et al., 2006).

Therefore, developing pre-service teacher students' understanding of attitudes toward occupation included knowledge about encouraging students to have a good attitude toward learning. It made the teaching and learning process smoother. Thus, the researcher is interested in developing e-learning on attitudes and teaching professions because e-learning discusses the use of information and communication technologies to allow access to online learning or teaching resources so it could provide faster learning at reduced costs, increased access to learning, and clear accountabilities for all partakers in the learning process (Gunasekaran et al., 2002; Arkorful & Abaidoo, 2014). Additionally, e-learning promotes the capability to learn independently and endlessly lifelong learning. It helps gain the characteristics of curiosity, learning, developing thinking skills, and screening skills for students' problems in their classes. Thus, e-learning should be used in teaching and learning (Laohchalassang, 2002; Pranapidorn et al., 2002). In addition, learners can use higher technology media that is easier to access, resulting in applying those technologies and promoting learning. There are critical, value-added, and innovative uses of social media that meet their needs. Teachers in this era must be coaches to upgrade the knowledge that the learners had come from learning by themselves (Fanchian, 2019)

Nevertheless, Gunasekaran, McNeil, and Shaul (2002) suggested that it is essential to emphasize e-learning to support throughout the educational process to at least some degree within an online distance learning scenario, such as learning materials, questions, and discussion, assessment, or support service. Furthermore, the beginning of the 2020 academic year was the period of COVID-19, and then the teaching and learning in the university were modified to be online. Therefore, developing a positive attitude toward learners with the method of developing e-learning encourage learners to learn anywhere. It is also related to the policy of managing education during COVID-19.

2. The Objectives of This Research

The objectives of this research were:

1) To develop e-learning on attitude toward learning and learning for pre-service science teachers.
2) To study the effect of e-learning on attitude toward learning and teaching for pre-service science teachers.

3. Methodology

A mixed method with a triangulation design is employed in this research, validating the quantitative data model (Creswell & Plano Clark, 2006). To answer the main research questions: 1) What is the characteristic of e-learning on attitude toward learning and learning for pre-service science teachers? Moreover, 2) How do pre-service science teachers develop an attitude toward learning and learning from e-learning? The participants were 22 pre-service science teachers, five males and seventeen females. The instruments in this study were a questionnaire with 20 items as a measurement to examine the knowledge and understanding of the participants and an open-ended questionnaire on participants' opinions toward e-learning lessons. There were 2 phases in the current study, and the details are shown below.

Phase I: Development of e-Learning on pre-service science teachers' attitudes toward teaching and learning

The problems of professional training experience in science teaching were examined in the academic year 2019, and it found that pre-service teacher students reflect issues related to attitude toward learning and teaching as Table 1 below.

Table 1. Pre-service science teachers' problems related to the attitudes toward teaching and learning

Issues	Elements related to attitudes
They could not be patient with the negative behavior of students.	Affective Component
They thought their students did not respect them as teachers and exhibited offensive behavior toward them.	Cognitive Component
They thought that their students' fundamental knowledge needed to be improved to be applied.	Cognitive Component

The problems were divided into components of attitude. The affective component reflected that participant had no tolerance for their students' negative behavior. In addition, the cognitive component recalled that participants thought their students did not respect their teachers and showed offensive behavior. Also, participants thought their students must develop fundamental knowledge to apply it. However, participants reflected their belief in transforming themselves into good teachers, as seen in Table 2.

Table 2. Pre-service science teachers reflected on the following approaches to transform themselves to be a good teacher

Issues	Elements related to attitudes
They needed to develop themselves to be an excellent example for their students.	Behavioral Component
They believed that personality and good words influenced how to behave in teaching.	Cognitive Component
They wanted to be confident in teaching.	Affective Component

The information from the participants' reflections was the source for developing an e-learning program to enhance the teachers' positive attitudes. This program was validated by examining the content validity of qualified experts in research, psychology, and educational technology. Each item-objective congruence (IOC) index was between 0.80 and 1.00. The experts suggested resequencing the content of the lesson. For the 20-item questionnaire, which was used to examine the knowledge and understanding of the participants and was a part of the e-learning program, the difficulty values were found to be between .20-1.00. The questions with a value below 1.00 would be adjusted to be more difficult by changing the choice options. The open-ended questions to investigate opinions toward this e-learning program were also developed and showed content validity at a 0.80-1.00 level of IOC. The experts also suggested adding one question for item 2, as seen in Table 4.

Phase II: The results from implementing e-learning on pre-service science teachers' attitudes toward teaching and learning

In this phase, e-learning was implemented in the research design of one group, pretest-posttest. The pre-test questionnaire was used to measure participants' attitudes at the beginning. Then, they were assigned to learn the e-learning for a period. After that, the 20-item post-test questionnaire was used to examine their knowledge and understanding after implementation. The participants took a questionnaire about e-learning. The researchers used the information obtained from the questionnaire to improve the content, develop e-learning, and summarize the results of the e-learning experiment.

For data analysis, the validity of each unit of the questionnaire was analyzed to provide the index of item-objective congruence: IOC and item difficulty of the questionnaire. The frequency and percentage were analyzed to depict participants' data. Furthermore, the relative gain scores were used to compare the experimental group's attitude before and after studying e-learning. Then, the data from the questionnaire was analyzed by mean S.D., and qualitative data was also analyzed by content analysis.

4. Results

According to the analyzed data, two main findings answered the research questions, including developing e-learning on pre-service science teachers' attitudes toward teaching and learning and how the pre-service science teachers' attitudes toward teaching and learning through
E-learning.

A. Developing e-learning on pre-service science teachers' attitudes toward teaching and learning.

The characteristics of e-learning on attitudes toward teaching and learning were contributed from the problem data of participants in professional training experience shown in tables 1 and 2 to develop e-learning on attitudes towards teaching and learning. The e-learning on attitudes towards teaching and learning consisted of 6 contents on video clips for 10 minutes each: 1) Meaning of attitudes and characteristics of attitudes, 2) Components of attitudes, 3) Factors for attitudes, 4) Method to change attitudes, 5) Attitudes development toward teacher

profession, and 6) Developing good attitude toward learning. E-learning on attitudes toward teaching and learning was structured as follows.

1) The Pretest questionnaire, with 20 items, was a tool to examine the knowledge and understanding of the participants. It covered all six contents before studying. The questionnaire examined how much of the participants' original knowledge was in the content. It included answers to the pretest questionnaire. So that participants could get instant feedback on their prior knowledge of the content. It was a self-assessment before starting to study.

2) The lessons in the e-learning presented the knowledge with the characteristics of fonts, animation, images, voice narration, and exercise to allow participants to review what they learned and understand from the lesson in this e-learning.

Figure 1. Example of e-learning on attitudes toward teaching and learning

1) The teaching material covered all six contents. Each lesson's learning objectives and outcome were to explain to participants what they would receive after completing each lesson's content and provide some reference documents.

Figure 2. Example of teaching material

2) Exercises were used to examine participants' understanding and opinions. After they finished studying e-learning and from the instructor, they were asked to complete the exercise and gave feedback immediately by having them know the correct answer to the exercise.

3) A post-test questionnaire after learning with 20 items was a tool to examine the knowledge and understanding of participants. It covered all six contents according to what is in e-learning and was used after studying. So that students could check their learning progress after completing their E-learning tasks. It included critical answers to the post-test questionnaire to provide participants with immediate feedback on how much they understood what they had learned. Explanations for each answer were provided to assist participants in verifying their understanding to gain persistence in learning.

B. Pre-service science teachers' attitudes toward learning and learning through e-learning.

The e-learning helped the participants increase their knowledge about attitudes toward teaching and learning and examined participants' background knowledge of this content before using e-learning. *Then, the participants studied e-learning and were examined again to compare knowledge* before and after using e-learning. The pretest and posttest scores of the e-learning were used for implementation to investigate the relative gain score that can be seen in Table 3.

Table 3. Relative gain scores from the pretest and posttest of the e-learning implementation

	Before	After	Relative gain score
Mean	12.59	19.22	89.47

*Sig < .05

As seen in Table 3, the participants showed an 89.47% increase in learning improvement when their pretest and posttest scores were compared to the relative gain score. Therefore, it seems that the experimental group had gained their knowledge and understanding of attitudes toward teaching and learning after the implementation of studying e-learning. Besides, it can imply that using e-learning on the attitudes toward teaching and learning could increase learning achievement. Participants could conveniently access additional e-learning because of the lessons developed using the Google Classroom application. This free application gave the code to students to access the lessons anytime they wanted. Furthermore, it was possible to review the lessons repeatedly as students needed. It is associated with the Law of Exercise that the more a stimulus-induced response is repeated, the longer it will be retained (Johnson, 2013)

C. Participants' opinions towards e-learning

Another objective of this study is to inquire about participants' opinions on learning through E-learning, in which the validity of the questionnaire was analyzed in each piece of content by showing the IOC. It found that the index of item-objective congruence (IOC) was 1.00. The experts suggested adding one question to the questionnaire (Item 2). The participants thought of e-learning, which can be seen in Table 4.

Table 4. Opinions of participants on learning through e-learning through lessons

No.	Issue	Comment level/Satisfaction		
		Mean	S.D.	Level
1.	The content of the e-learning is appropriate.	4.22	.64	High
2.	Clarity in explaining the content	4.11	.83	High
3.	The interest of the lesson	3.27	1.07	Medium
4.	A series of pre-tests are appropriate.	4.05	.99	High
5.	A series of post-tests are appropriate.	4.16	.92	High
6.	The duration of the study is reasonable.	3.88	1.02	High
7.	E-learning makes learning easier.	3.88	1.18	High
8.	E-learning motivates you to interact with learning	3.11	.96	Medium
9.	The lessons increase your knowledge about attitudes toward the teaching profession	4.05	.93	High
10.	E-learning lets you know the guidelines for change in attitudes toward learning	3.83	.98	High
11.	E-learning makes you realize the importance of attitudes toward the teaching profession.	4.05	.80	High
12.	Content from e-learning allows you to use it in your daily life.	4.00	.68	High

Table 4 shows that the participants had high opinions on the overall e-learning (mean 3.88 from 5.0). The participants commented that the e-learning content was initially appropriate (mean 4.22). The e-learning was motivated by learning interaction at the end (mean 3.11).

The participants recommended that e-learning allowed students to manage their studies themselves. It was convenient to learn from any place, and they could always review content to learn at any time. The lessons were consistent with cognitive-based learning, which used strategies of giving participants the best access to learning materials to transfer what is received through the senses to short-term memory, such as reading, seeing, touching, etc. The e-learning contents were developed by using mixed media to create. Participants could read the content from the teaching material and listen to the content audio explaining the lesson simultaneously (Khlaisang, 2012). Thus, knowing through e-learning had benefits in terms of convenience and lesson reviewing at any time. However, the participants suggested that audio narration should be improved from monotonous to more energetic and motivating, and the exercises' direction should be clarified.

5. Discussion and Conclusion

After finishing the e-learning implementation, the participants reflected on the strengths of the e-learning as follows: 1) The program can be learned from anywhere. It can always be opened for content revision at any time; 2) Participants can go back and learn again when they do not understand; 3) They can manage and design their studies pace and time by themselves;
4) Participants can further their learning when the work is done, and 5) It is convenient that teaching materials are divided into topics clearly and thoroughly.

Consequently, e-learning should comprise various forms of content presentations, like learning experience management, network communication of learning, content developers and experts, learning experience management, learning network communication, content developers, and experts (Gunasekaran et al., 2002). Therefore, each component was taken as this e-learning using Google Classroom. It is a free application designed to help students and teachers link, collaborate, manage, and do assignments, empowering them to learn without paper. As a digital tool, Google Classroom is only accessible to users with Google Apps for Education (Hussaini, Ibrahim, Wali, Libata, & Musa, 2020). Moreover, much research showed that Google Classroom organizes well in terms of accessibility, perceived benefit communication and interaction, and delivery of instruction. In that way, it was effective in improving students' accessibility and attention to the learning, knowledge, and skills gained from Google Classroom and making students active learners as a Digital Tool (Shaharanee, Jamil, & Rodzi, 2016; Hussaini, Ibrahim, Wali, Libata, & Musa, 2020).

The participants' opinions reflected that e-learning still did not cause the interaction of learning as it should be. Their opinions were at a moderate level (mean = 3.11). Therefore, to improve e-learning, the learning interaction must be increased. Research by Zhang, Zhou, Briggs, and Nunamaker (2006) found that video learning in e-learning was effective for learning. It depended on the interaction preparation. Learners in an e-learning environment providing interactive video learning had better learning productivity.

According to Table 3 and Table 4, the high relative gain of knowledge about attitudes toward teaching and learning is supported by the results of participants' opinions at a high level on the overall e-learning program. Findings indicate that the developed e-learning effectively increases pre-service science teachers' attitudes toward teaching and learning. This is because the developed e-learning consisted of six content related to attitudes. So, pre-service science teachers would understand attitudes toward teaching and learning through e-learning implementation. These findings align with Malkawi et al. (2020), who found that undergraduate students had high and positive attitudes towards e-learning and virtual classes during the COVID-19 pandemic.

Hence, these opinions agree with the advantages of e-learning: the flexibility of time and place for learners to deliver or receive information according to learning (Arkorful & Abaidoo, 2014). Moreover, due to the COVID-19 period, educational institutions and students worldwide seem to recognize and appreciate online learning platforms. The explanations for this receiving were that it was easy to use, it was flexible in learning, and it was a controlled environment. Before the pandemic, E-learning was acknowledged as real learning or a formal form of education; this has enforced a global turn to e-learning solutions (Khan, Vivek, Nabi, Khojah, & Tahir, 2020). Nevertheless, participants also reflected on improving this e-learning: the explanation's sound was monotonous. It should be accustomed to gaining more excitement, and there should be more detailed directions for exercise in greater detail.

Attitudes toward teaching and learning for pre-service science teachers were critical because if the teachers or instructors had a good attitude toward teaching and learning, it would affect their students ' good attitude toward learning as well. Based on the results, It can be concluded that the developed e-learning effectively increases

pre-service science teachers' attitudes toward teaching and learning. Due to COVID-19, student teachers have had to use online learning. Thus, learners could manage learning by themselves. Learners could learn from any place and repeated learning to learn anytime.

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Authors contributions

Dr. Varangkana Somanandana was responsible for study design, data collection, and revising. Dr. Sasithep Pitipornpatapin drafted the manuscript, and Dr. Pichawat Sophonpanyarasmi revised it. All authors read and approved the final manuscript.

Funding

This work was supported by the Department of Educational Psychology and Guidance, Faculty of Education, Kasetsert University.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Canadian Center of Science and Education.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.