Reflection-Based Learning in Virtual Environments for Pre-service Teachers

Nuntiya Noichun

***Abstract*—The virtual environment is closely related to social currents in terms of the development of advanced technology, different learning environments, and changes in human behavior over time. This study observed students' academic achievement and investigated the results of learners' reflection-based learning in a virtual environment among pre-service teachers. The participants were selected from among second-year students at Suan Sunandha Rajabhat University: 38 were in the experimental group, and 38 were in the control group. The findings indicated that the experimental group had achievement significantly different from that of the control group at a .05 level of significance. The results for the reflection level were at 80.26%, a higher value than among students in the control group, who had a reflection level of 50.07%. These results indicate that reflection-based learning in the virtual environment impacts academic achievement. Reflective skills are also useful for learner practice.**

***Index Terms*—Reflection-based learning, reflective skills, virtual environment, pre-service teachers' learning.**

I. Introduction

Learning management that adopts information technology and telecommunications supplemented by electronics and novel teaching methods shows the potential to adjust the learning process, which can promote students' learning acquisition and enable them to access information easily and rapidly. Moreover, it can promote peer interaction and mutual cooperation to construct new knowledge anywhere and at any time. It is associated with the development of information technology to meet national policies, preparing for the coming information technology society, and address the knowledge society. The information technology society and the knowledge society are essential elements in twenty-first-century skills, which provide students with opportunities for communication via electronic devices, arouse them to make their own knowledge, promote students' critical thinking skills, enable them to encounter any situation, and apply their knowledge for problem resolution appropriately.

The virtual environment is closely involved with social currents, including the development of technology, the expansion of learning environments, and the alteration of human behaviors with over time. In instructional management, students have the chance to consider their own opinions on cooperation and their own products, which can enable students to improve their flawed assignments. Reflective thinking allows many things to be carefully examined through consciousness and meditation, enabling people to review their practices. Additionally, people can understand and learn from previous experience [1]. This can lead to self-improvement, superior work performance, and effective problem-solving. Reflection-based learning is a critical skill that gains from reflective practice review. Further, information technology has recently reached a high standard, particularly in its use in media, including online lessons conducted over internet systems, interactive lessons, and learning-based VDO conferences. All of these are relevant to the knowledge-based society and offer equivalent opportunities to all in accessing and being educated in the online community anywhere and at any time. As noted previously, learning management conducted in the virtual environment is in accordance with learning in various situations. For this reason, researchers are interested in investigating the results of reflection-based learning in the virtual environment for pre-service teachers to better understand technological advancement in the knowledge society and identify means of adapting learning management to develop students' academic performance.

Manuscript received April 19, 2022; revised May 31, 2022.

Nuntiya Noichun is with Faculty of Education, Sunandha Rajabhat University, Thailand (e-mail: Nuntiya.no@ssru.ac.th).

II. Research Objectives

To compare students' academic achievement using reflection-based learning in a virtual environment among pre-service teachers with students in normal programs.

To investigate the results of learners' reflection-based learning in a virtual environment among pre-service teachers with students in normal programs.

III. Research Hypothesis

Students' academic achievement using reflection-based learning in a virtual environment for pre-service teachers is higher than the achievement of students in a normal environment.

IV. Scope of the Research

A. Population and Sample

The study population included 501 second-year pre-service teachers from the seven branches and classified into two small groups for each branch, for a total of 14 groups, studying at the Faculty of Education of Suan Sunandha Rajabhat University. The study was carried out during the second semester of academic year 2021. From this population, 76 participants were selected using cluster random sampling from two groups of one branch. The first

doi: 10.18178/ijiet.2022.12.10.1722

group contained 38 students using reflection-based learning in a virtual environment, and the other was 38 students in a normal program.

B. Variables

1) The independent variable was reflection-based learning in a virtual environment.
2) The dependent variables are students' academic achievement and level of reflection.

C. Research Instruments

1) The Achievement tests
2) Reflective assessment

V. Literature Review

A. Reflection-Based Learning

Reflection-based learning is a conceptional and theoretical learning management tool using classroom rearrangement that can be applied to real situations and that learners can employ to create their own knowledge and apply it in their lives. It can promote student-centered learning by allowing individual learning styles to be determined such that teachers can manage instructional styles corresponding to their students' demands, abilities, and interests in real situations [2]. This can enhance the learning process to allow it to effectively continue and systematically and efficiently achieve target goals. Furthermore, learning management can be a plan or pattern for classroom-based learning or small-group training. It also covers teaching materials, books, films, audiotapes, computer program, and subject curricula [3]. These instructional patterns are beneficial for instructional design, which can help learners achieve their learning purposes. Apart from this, patterns of authentic instruction must foster students' knowledge, conception, skills, values, ways of thinking, and self-expression. Teaching styles should also be involved with students' reality. The most important teaching outcomes over the long term are to enhance students' learning abilities and elicit students' performance. Enhancing students' learning abilities can help them learn and develop their efficacies more easily. This is because of the knowledge and skills received from controlling the self-learning process. Furthermore, eliciting performance is helpful for students in expressing their learning competency. For instance, students are engaged in joining in the learning activities, in which teachers manage their learning atmosphere by preparing materials for new knowledge construction and giving them feedback. Providing feedback can help learners accept the outcome of their learning activities, whether correct or incorrect. Learners then have the opportunity to improve their incorrect responses and achieve their targets. The repetition and application of knowledge to new situations is practical for learning transfer and learning via digital technologies, as well as computer-based learning [4].

Reflection is a process of thinking and consideration in which a person consistently applies thinking to something. Beliefs and knowledge are considered to be based in part on evidence. In addition to beliefs and knowledge, the nature of reflection and changes in the learning process are considered as factors that influence beliefs and knowledge [5]. There are two kinds of reflection: reflection in action and reflection on action. Reflection on action is a process in which practitioners are away or in a difficult situation and take account of the circumstances or the problems that arise while doing the activity. This kind of reflection can help practitioners develop skills for problem classification and consider the related environment to solve the problem. Reflection on action can also be a profound process. It can raise awareness or knowledge of action, which is sometimes difficult to describe. However, it is also an expressive action, and it reflects actions that we encounter in unexpected situations. If we meet unexpected situations, we can develop problem-solving skills and shift the different views on problem-solving. Another kind of reflection is reflection on action, also referred to as lessons learned, a process in which practitioners recall previous actions to apply and adopt that experience in the situations by analyzing and interpreting their lessons and consider how to handle with the circumstance, and how the lesson impacts unexpected outcomes. This kind of reflection can provoke practitioners to learn, as well as understand the situation and promote self-action. Additionally, this also helps learners deal with things in various forms.

The circulation of reflection-based learning consists of six steps [6], as follows:

1) Description refers to the act of describing something, arousing reflection from the feeling with which a person faces the given situation.
2) Feelings are shared through the exchange of experience that people use to meet a certain situation. This refers to a reflective feeling and reaction to a given situation, such as lack of confidence, fear, or confusion while working.
3) Evaluation is an assessment analysis that is based on experience, whether it is positive or negative in relation to accidents, situations, or similar problems. Then, the values produced are used for decision making.
4) Analysis refers to the examination of general situations based on previous experience, which can help clarify an ongoing situation.
5) General conclusions refer to the use of cause-and-effect analysis, summary-based cooperating experience, and conclusion of problem-solving resolution using previous experience to summarize.
6) Personal action plans are plans to adapt what we learn to new situations to clarify issues or enhance self-improvement. If a situation occurs repetitively, how do we deal with it and in what ways? How do we pass through it?

B. Virtual Learning Environment

A virtual learning environment is an effective platform for communicating with learners via a website, assessing learning achievement, providing follow-up support to learners, and allowing cooperative learning and communication tools, which are accessible both within and outside of the university. A virtual learning environment can be developed through a welcoming classroom in which teachers can provide teaching materials for students via

technology or web-based platforms. A web-based platform is a virtual learning environment created using technology-based learning. This can enable students to better understand lessons in place of traditional teaching [7]. It is a form of informal education. Learners can pursue this method anywhere and at any time; it is not necessary to study in one place only. A variety of media can be used to activate learners' acquisition and extend their flexibility in time and place. It focuses on learners' convenience and preparation, and students are provided with opportunities in selecting their learning styles including abundant media. Meanwhile, information technology and telecommunications are seeing consistent advances, and networks are becoming accessed ever more broadly. Users can use the system with any device, if the system is appropriately designed to support the use of multiple platforms. From this technological advancement, social sustainability can be supported through social interactions via social networks that can enable learners to communicate with their peers and teachers more conveniently. This can motivate learners and reflect on their learning process. The main components of the virtual learning environment consist of technology, communication, people, and contents. Furthermore, there are small components, as follows: in terms of information technology that scholars use, including the internet, websites, digital resources, and device access. Many researchers have identified that a virtual learning environment is composed of feedback, interaction, and social networks. In terms of human resources, this concept includes learners and instructors as well. The contents of the lessons as well as their evaluations are included in the lesson part. Thus, the social network and the internet influence the virtual learning environment. The benefits of the virtual learning environment are effectively downloadable material, and the advantages of content subjects, functions, and implementation of ICT devices used in learning [8], [9].

C. Conceptional Framework

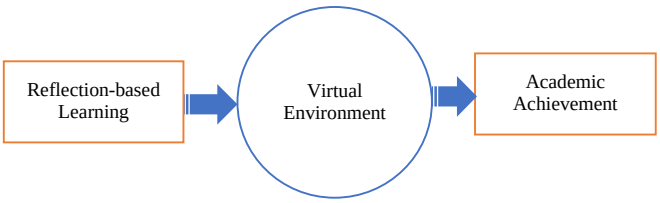

Fig. 1. Conceptional framework.

Fig. 1 presents the conceptual framework for research to study the outcomes of learning management by arranging reflective learning through a virtual environment under the expectation that higher academic achievement will be produced for students.

VI. Data Collection

An experiment using reflection-based learning in a virtual environment with pre-service teachers was conducted in a real instructional environment with bachelor's degree students in the Faculty of Education, Suan Sunandha Rajabhat University. The participants were the 76 students who were registered for the subject of Emotional Quotient Development for Early Childhood in the first semester of the 2021 academic year. A quasi-experimental research design in a two-group pretest–posttest design was used. Two groups of participants were included in the experiment with the pretest. Both groups had 38 members drawn from among the early childhood students. Group 1 were taught using cooperative instruction via electronic devices. Group 2 were taught using normal learning management. The study was conducted over the course of the entire semester, and a test was administered after the treatment. The pretest–posttest design is presented in Table I.

TABLE I: Pretest–Posttest Design

Group	Pretest	Experiment	Posttest
O_1	$T_{1/1}$	X_1	$T_{1/2}$
O_2	$T_{2/1}$	X_2	$T_{2/2}$

O_1 refers to the experimental group using reflection-based learning on the virtual environment for pre-service teachers.

O_2 refers to the control group, using normal instruction.

$T_{1/1}$ refers to the pretest results of the experimental group using reflection-based learning on the virtual environment for pre-service teachers.

$T_{1/2}$ refers to the posttest results of the experimental group using reflection-based learning on the virtual environment for pre-service teachers.

$T_{2/1}$ refers to the pretest results of the control group in normal instruction.

$T_{2/2}$ refers to the posttest results of the control group in normal instruction.

X_1 refers to reflection-based learning on the virtual environment for pre-service teachers.

X_2 refers to normal learning.

1) The test before the experiment examined the subject of Emotional Quotient Development for Early Childhood.
2) The experiment using reflection-based learning on the virtual environment for pre-service teachers was carried out during the second semester of the academic year 2021 (16 weeks).
3) During the experiment, the participants were assigned to provide reflections three times at 2-week intervals. When the reflection writings were evaluated, researchers consulted the participants to improve their work.
4) After the experiment, the posttest was administered to investigate academic achievement in the subject of Emotional Quotient Development for Early Childhood.

VII. Statistics

A t-test for independent samples was employed to compare the students' academic achievement using reflection-based learning on the virtual environment for pre-service teachers and students in normal instruction. Meanwhile, percentages were statistically used for the result of reflection level.

VIII. Research Results

1) The efficiency of reflection-based learning in the virtual environments for pre-service teachers was identified using the sum of during-learning scores and

after-treatment scores and finding the arithmetic mean. As mentioned, the experimental group was provided with lessons, and then a posttest was administered. When the students completed all of the lessons, the posttests for each were calculated to assess the students' academic achievement, and then the sum of during-learning and after-treatment scores was calculated to find arithmetic mean. The analysis results for efficiency of reflection-based learning on the virtual environment for pre-service teachers are presented in Table II.

TABLE II: ANALYTICAL RESULTS FOR THE EFFICIENCY OF REFLECTION-BASED LEARNING ON THE VIRTUAL ENVIRONMENT FOR PRE-SERVICE TEACHERS

Activities		Posttest		Efficiency
Num. of Students	E_1	Num. of Students	E_2	E_1/E_2
38	82.21	38	84.21	82.21/84.21

Table II indicates that the efficiency of reflection-based learning for the virtual environment among pre-service teachers was E_1/E_2 = 82.21/84.21, which indicates a mean test score during the study of each lesson using reflection-based learning in a virtual environment for pre-service teachers of E_1 = 82.21. The mean posttest score for reflection-based learning in a virtual environment for pre-service teachers was E_2 = 84.21. This revealed that reflection-based learning in a virtual environment for pre-service teachers can be used to achieve the purposes of the study.

E_1/E_2 is the model for process and product-based developmental testing in instructional media and instructional packages. E_1 indicates the percentage of the average of all scores that the students earn from their activities or assignments, including drills, exercises, project work, or other types of formative evaluation. E_2 is the percentage of the average or means of all scores the students earn from their posttest, final examinations, and other summative evaluation [10].

2) The results for the academic achievement comparison are shown in Table III.

TABLE III: COMPARISON OF ACADEMIC ACHIEVEMENT

Learning management	$\overline{X}$	S.D.	t	p-value
Reflection-based learning in a virtual environment	52.89	3.48	7.524	.005
Learning with normal instruction	43.00	7.32		

* *Statistical significance level of .05*

Table III indicates that that the posttest results between students using reflection-based learning on the virtual environment for pre-service teachers and students in normal instruction were significantly different at a statistical level of .05. This indicates that reflection-based learning in the virtual environment for pre-service teachers produces academic achievement that is greater than the academic scores of students in normal instruction.

3) The assessment results for the reflection level presented the results of students' use of reflection-based learning in a virtual environment for pre-service teachers and students in normal instruction.

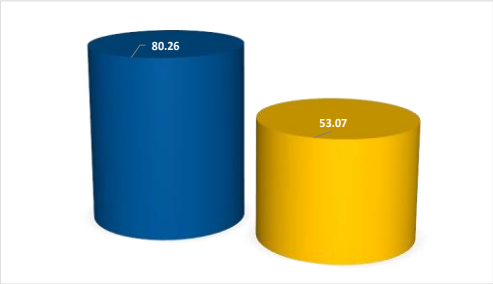

Fig. 2. Students' reflection on virtual environment for pre-service teachers and students in normal instruction.

Fig. 2 shows the percentage eliciting the assessment result of the reflection level among students using reflection-based learning in the virtual environment for pre-service teachers and students in normal instruction. Additionally, it was found that the student group using reflection-based learning in the virtual environment gained a reflection level at 80.26%, while students in normal instruction achieved a reflection level of 53.07%.

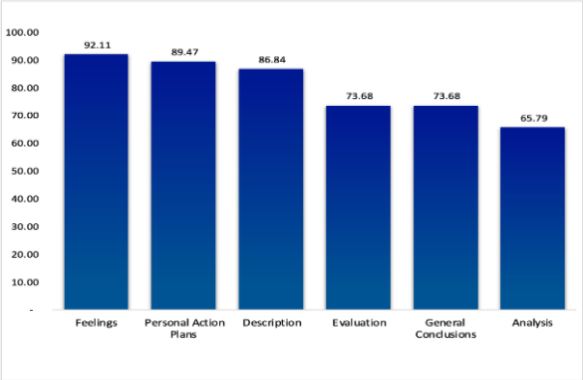

Fig. 3. Reflection levels of students using reflection in the virtual environment (n.38).

From Fig. 3, the assessment results of the reflection level are given in percentages, which indicated that students gained the reflection level. When the reflection level was classified, it showed that feeling had the highest reflection level (92.11%), followed by personal action plans (89.47%), description (86.84%), evaluation (73.68%), general conclusions (73.68%), and analysis (65.79%).

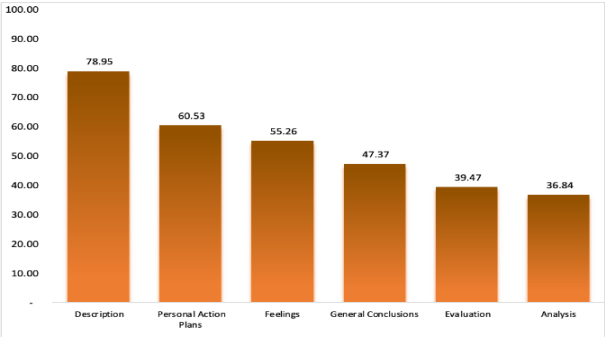

Fig. 4. Reflection levels of students in normal instruction (n.38).

As can be seen in Fig. 4, the assessment results for the reflection level in percentage showed the reflection level achieved by students in normal instruction. In the classifications of reflection levels, description had the highest level (78.95%), followed by personal action plans (60.53%), feelings (55.26%), general conclusions (47.37%), evaluation (39.47%), and analysis (36.84%).

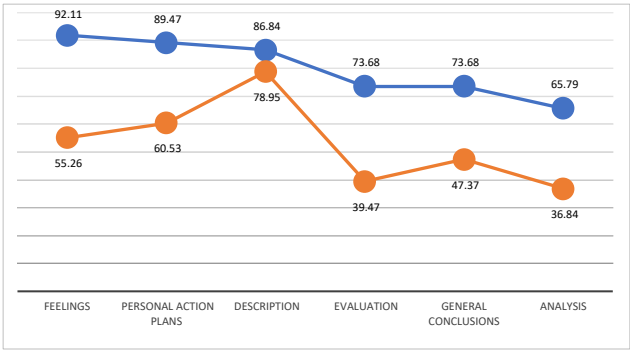

Fig. 5. Percentage of students classified by reflection level (n.38:38).

Fig. 5 presents the percentage scores of students using reflection-based learning in a virtual environment and students in normal instruction. When classified by reflection level, it was shown that students using reflection-based learning on the virtual environment received the highest reflection level for feelings, at 92.11%, while students in normal instruction earned a reflection level for feelings at 55.26%. The experimental group earned a reflection level for personal action plans of 89.47%, while the control group had 60.53%. Interestingly, it was found that students at the normal instruction had a reflection level in description as the highest level (86.84%), while the lowest reflection level among two groups was in analysis: the experimental group had a reflection level of 65.79%, while the control group received a level of 36.84%.

IX. Conclusion

1) Reflection-based learning in the virtual environment for pre-service teachers had the following components: the first included principal, conception, theory, and national development, which are relevant to the federal support from the National Education Act of B.E. 2542 (1999) and its Amendments (Second National Educational Act) B.E. (2002), as well as other related policies, the current state of affairs, available information technology, and telecommunication systems. Learning management was consistent and appropriate for learner needs, focused on student-centered approaches. Learning management consists of various principles. The first is that learning should be student-centered; teachers have the role of being a source of knowledge, an advisor, and a consultant. The second principle is reflection in action; that is, students should reflect on their own ideas on their situation or the problems they encounter while participating in the activities. The third principle is classroom management, which provides learners with opportunities for training in teams so that they can create their own knowledge and reflect on their abilities in applying knowledge in both theory and practice through small groups and cooperative work. It seems that practice through small groups and cooperative work can achieve the goal of new knowledge construction via cooperative communication, as well as reflection through electronic devices and social networks. The fourth principle was authentic assessment. Finally, the fifth principle was that teachers served students as necessary knowledge providers and advisors. The second component featured several goals and purposes. The first of these was to enhance students' academic achievement at a higher level, covering knowledge, understanding, and knowledge application.

The second purpose of the project was to promote learners' reflection. The third component centered on managing learning activities in terms of reflection-based learning on a virtual environment, engaging students to meet their instructors and peers on a video conference or social networks. However, this depended on students' preparation to using technology. This was likely to classify learners in small groups and foster them to conduct collaborative work, which everyone in a group was responsible for in terms of their role in achieving the goals of new knowledge creativity through cooperative work and reflection: this was in the form of teaching technology. Specialists considered that the overview of developed cooperative learning was at the appropriate level (IOC value = 0.98). When examining each component in developed cooperative learning, it was found that every component was suitable; the components of principal, conception, theory, and subject content had an IOC value of 1.00, and the other component was goals and purposes rated at an IOC value of 0.95. Based on the efficiency of reflection-based learning on an virtual environment for pre-service teachers, it was found that pre-service teachers had an efficiency of E1/E2 = 82.21/84.21. This indicates that reflection-based learning on an virtual environment for pre-service teachers is effective for meeting the purpose of the study.

2) The comparison of academic achievement found that the comparison of the students' academic achievement using reflection-based learning in the virtual environment for pre-service teachers with the students in normal instruction. From the analytical results, it was found that the posttest achievement scores between the students using reflection-based learning on the virtual environment and the students in normal instruction were significantly different at a statistical level of .05. Therefore, it can be assumed that reflection-based learning in a virtual environment for pre-service teachers has an academic achievement that is greater than the academic scores of students in normal instruction.
3) The assessment results on the reflection level it showed the assessment results of reflection level compared between students using reflection-based learning on virtual environment for pre-service teachers and students in normal instruction. The findings indicated that the student group using reflection-based learning for virtual environment for pre-service teachers gained a reflection level at 80.26%, which was higher than that of the group of normal instruction (53.07%). When classified by reflection level, it was found that students using reflection-based learning on the virtual environment received the highest reflection level in term of feelings at 92.11%, while students in normal instruction earned a reflection level in feelings at 55.26%. The experimental group earned a reflection level in personal action plans at 89.47%, and the control group received a reflection level in personal action plans at 60.53%. Interestingly, it was

found that students in normal instruction had the highest reflection level for description (86.84%), while the lowest reflection level between two groups was in analysis: the experimental group gained a reflection level at 65.79%, while the control group received a level of 36.84%.

X. Discussion

Based on these findings, it can be discussed in accordance with rational principles as follows: reflection-based learning on virtual environment for pre-service teachers, which was developed under principles, conceptions, theories, and the development of the quality of working life. This is relevant to the federal support given through the National Education Act of B.E. 2542 (1999) and its amendments (Second National Educational Act) B.E. (2002) [11]. In addition to this, information technology and telecommunications should be applied to learning management to meet students' demands and promote students' interests, reflection on what they learn, and, ultimately, their performance [4], [12]. This was in accordance with the goal of the learning management, namely, promoting students' learning. Additionally, reflection-based learning in a virtual environment for pre-service teachers offered learners the opportunity to create their own knowledge and reflect on their ideas. It also enhanced students' knowledge application to achieve the target of new knowledge construction through cooperation and reflection using video conference, social networks, and authentic assessment. Teachers mainly served as a facilitators and consultants. In relation to the academic achievement of both groups, it was found that the posttest results between students using reflection-based learning on virtual environment for pre-service teachers and students in normal instruction were significantly different at a statistical level of .05, which was achieved in the target assumption. Thus, reflection-based learning on virtual environment for pre-service teachers produces an academic achievement that is higher than the academic scores of students in normal instructions. The reason for this was that the learning environment via information technology, telecommunication, and cooperation played a significant role in information exchange, and this led to knowledge sharing in relation to what they were interested in and applying it [13], [14]. Information technology and telecommunications have seen significant advances and are more accessible through various channels. Learners can obtain information through numerous devices, such as smartphones, tablets, notebooks, and computers. However, the system should support multiple platforms.

The assessment results of the reflection level of students using reflection-based learning on virtual environment and normal learning management indicated that the experimental group received a higher reflection level than the control group. This was confirmed by the study of developing reflective skills of student teachers in the virtual learning environment [15]. From this study, it was found that pre-service teachers are profoundly motivated to performance and further reflection, in a significant difference from the use of reflection-based learning in a normal classroom, individually. Apart from the study of the influence of virtual learning environments in students' performance, it was found that there were positive indicators toward the use of reflection-based learning in the virtual environment [16]. The indicators positively impact on learning activities and creating their own products. This was agreeable for the study of reflection on the virtual learning environment during the COVID-19 pandemic period [17]. The findings indicated that the environment provided greater opportunities for teachers to connect with professional relationships, develop academic cooperation, and enhance cooperative learning skills. This approach will be beneficial for use on current teaching for pre-service teachers. Therefore, it can be assumed that reflection-based learning on an virtual environment for pre-service teachers can raise students' academic achievement in a higher level and it can be used for students' reflection practice.

XI. Recommendations for Further Study

1) Reflection-based learning should be developed in the form of cloud services through the use of modern technology and various forms to keep up with the latest developments in information technology and telecommunication.
2) Reflection-based learning can also be investigated in term of learning efficacy and relatively desired characteristics for pre-service teachers.

Conflict of Interest

The author declares no conflict of interests.

Acknowledgments

The author thanks the officials and students who cooperated in this research.

References

[1] C. Johns, *Becoming a Reflective Practitioner: A Reflective and Holistic Approach to Clinical Nursing, Practice Development and Clinical Supervision*, Oxford: Blackwell Science, 2000.

[2] W. James, B. L. Richard, and F. H. Fred, *Instruction Technology, Media, and Method*, New York: McGraw-Hill, 1983.

[3] J. Weil and Calhoun, *Model of Teaching*, 7th. Ed. Boston: Preason Education, 2004.

[4] R. M. Gagne', W. W. Wager, K. C. Golas, and J. M. Keller, *Principles of Instructional Design*, New York: Holt, Rinehart & Winston, 2005.

[5] V. Carter, *Dictionary of Education*, New York: McGraw-Hill Book, 1973.

[6] G. Gibbs, *Learning by Doing: A Guide to Teaching and Learning Methods*, Oxford: Further Education Unit, 1988.

[7] Liaw *et al*., "Design and evaluation of a 3D virtual environment for collaborative learning in interprofessional team care delivery," *Nurse Education Today*, vol. 81, pp. 64–71, 2019, https://doi.org/10.1016/j.nedt. 2019. 06.012

[8] C. Chookusol and P. Wannapiroon, "Virtual learning environment via smart coworking space," *Journal of Education and Innovative Learning*, vol. 1, no. 1, pp. 97–110, 2021.

[9] M. T. Garc ıa-Álvarez, I. Novo-Corti, and L.Varela-Candamio, "The effects of social networks on the assessment of virtual learning environments: A study for social sciences degrees," *Telematics and Informatics*, vol. 35, no. 4, pp. 1005-1017, 2018.

[10] C. Brahmawong, "Developmental testing of media and instructional package," *Silpakorn Educational Research Journal*, vol. 5, pp. 7-20, 2013.

[11] National Education Act B.E. 2542 (1999) and Amendments (Second National Education Act B.E. 2545. (2002). [Online]. Available: https://www.sl.ac.th/addons/qa/9.pdf

[12] W. Walter *et al*., *Principles of Instructional Design*, New York: Holt, Rinehart & Winston, 1988.
[13] M. R. Rivas and J. Escola, "Virtual learning communities: Review of a decade of Spanish-Portuguese scientific production," *Jett*, vol. 7, no. 1, pp. 11-24, 2016.
[14] T. Korbuakaew, I. Robroo, and S. Korbuakaew, "The development of online active learning management with application for pre-service teachers," *International Journal of Information and Education Technology*, vol. 12, no. 1, pp. 77-81, 2022.
[15] S. Zuzana and C. Ivana, "Developing reflective skills of student teachers in the virtual learning environment," *Electronic Journal of e-Learning*, vol. 16, pp. 107-121, 2018.
[16] A. Paulo, M. Lu ́ła, and M. Carlos, "The influence of virtual learning environments in students' performance," *Universal Journal of Educational Research*, ISSN 2332-3205, vol. 5, no. 3, pp. 517-527, 2017.
[17] H. A. Sastramiharjo, V. S. Damaianti, and Y. Mulyati, "Reflection of the virtual learning environment in the covid-19 pandemic period," in *Proc. the 2nd African International Conference on Industrial Engineering and Operations Management Harare*, Zimbabwe, December 7-10, 2020.

Copyright © 2022 by the authors. This is an open access article distributed under the Creative Commons Attribution License which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (CC BY 4.0).

Nuntiya Noichun was born Suphan Buri TH. She received the bachelor of education (B.Ed.) degree in early childhood education from Chulalongkorn University, in 1985, and education administration from Sukhothai Thammathirat University TH, in 1989, the master of education degree in early childhood education from Chulalongkorn University, TH, in 1989, the doctoral of philosophy degree in education administration from Silpakorn University TH, in 2007.

She is currently an associate professor at the faculty of Education, Suan Sunandha Rajabhat University. She is a lecturer of program in Early Childhood Education department, Vice President for Academic Affairs, Suan Sunandha Rajabhat University and Internal Quality Assessor of the Office of Higher Education Commission,TH. Her research interests cover the pedagogy and educational administration.