Development of the e-collaborative learning model to enhance the teamwork of preservice teachers

Intira Robroo, *Suan sunandha Rajabhat University*, *Thailand, intira.ro@ssru.ac.th*

ORCID: 0000-0002-3873-5390

Abstract. The purpose of this research is to develop the E-collaborative Learning Model to enhance the teamwork of preservice teachers, to compare the learning achievement result, and to study the characteristics of teamwork. The sample group is 38 from Cluster Random Sampling and drawing lots to set experimental group. The result shows that the E-collaborative Learning Model consisting of the learner centric learning and setting environment by allowing learners to practice working by teamwork, evaluating learning outcomes with real situation and instructors provide necessary basic knowledge. The experimental outcome reveals that learning achievement is significantly different from normal situation at the statistical level of 0.05. In summary, the E-collaborative Learning Model to enhance the teamwork of preservice teachers causes higher learner's achievement and can be used to develop working by teamwork.

Keywords: Collaborative learning model, e-collaborative learning, pre-service teachers learning.

INTRODUCTION

Developing the learning of population to be persons who love learning throughout their life effectively, it is required learners to search for knowledge by themselves which leads to live long learning. In addition, it is essential that learning should allow learners to select various educational media as their needs and congruent with current educational technology. The combination of using electronic media and learning method to enhance learning process focuses on enhancing learning method by using information technology and telecommunications to access information quickly and react with friends conveniently, leading to collaboration in building new knowledge and review knowledge obtained from electronic media whenever they want. This is also congruent with the development of technology for education in Thailand's policy in order to prepare for being Information Technology Society and Knowledge Society. Every country aims to focus on developing human resource who have intelligence and skill of critical thinking, Life Long Learning, and Information, Communication and Technology Literacy, which are essential skills for 21st century and react to various learners. Contemporary learning management should develop learning methods corresponding to social and environmental advancement of social communication which changes dramatically. Therefore, we should provide various learning environment, knowledge, learning media and allow learners to communicate each other through electronic media by using accessible and appropriate technologies for the complex course, such as individual chat recommended for students who are shy to ask question (Tawafak, et.al., 2021). The learning management should focus on self-learning which learners can search for knowledge of their interests from several learning sources This enables learners to have critical thinking skill that can help them face with situation and suitably adapt knowledge for preventing and correcting problems. While telecommunications system developed dramatically and efficiently, the collaborative online learning ensured that students satisfy with the educational process and motivates learners to make more efforts to acquire new knowledge and skills. Furthermore, the students can understand the contents, and promote mutual learning through the exchange of ideas and knowledge (Zhampeissova, et.al., 2020). The students reasonably committed to online discussion forums. This could be because they had technological skills, beneficial platforms, and were less distracted when engaging online (Aderibigbe, et.al., 2021). Indiat et al. (2021) revealed that online learning was relied on android applications as a very helpful means of maximizing the efficiency of teaching and learning activities.

As previously mentioned, researcher was interested in developing e-collaborative model to enhance the teamwork of preservice teachers that was congruent with current learning methods whereas the advancement of communications technologies enabled learners to learn conveniently, such as mobile learning. As a result, this caused the higher efficiency of interaction between learners and learners as well as instructors (Alam and Aljohani, 2020), which helped learners create new knowledge anytime anywhere in the context of knowledge society.

METHODS

This study used the Research and Development (R&D)method. Creating the e-collaborative learning model to enhance the teamwork of preservice teachers uses the content in EDP3102 educational innovation and information technology, bachelor of education program, Suan Sunandha Rajabhat University, which consists of principle, theory, technology and educational innovation, quality development of information technology learning, learning resource, social networks, software usage, problem analysis of using information technology innovation, and design of learning innovation.

Objectives of the research

To develop the E-collaborative Learning Model to enhance the teamwork of preservice teachers, to compare learning achievement result of learners who using e-collaborative learning to enhance the teamwork of preservice teachers with learners who using the conventional. And to assess teamwork performance of Preservice Teachers who learned by using e-collaborative Learning to enhance the teamwork of preservice teachers with learners who using the conventional

Research hypothesis

Learning achievement result of learners who using e-collaborative learning to enhance the teamwork of preservice teachers is higher than learning achievement result of learners who using the conventional. And teamwork performance of preservice teachers who learned by using e-collaborative method was rated as good.

Population and sample

The population used in this research was 501 third year undergraduate students, Faculty of Education, Suan sunandha Rajabhat University. They studied 1st semester of 2019 from 7 departments consisting of 14 units. Cluster Random Sampling was derived from 1 department and 2 units. Then random assignments was derived from 38 students of faculty of Thai language who studied unit 001 by using e-collaborative learning model to enhance the teamwork of preservice teachers and 38 students of faculty of Thai language who studied unit 002 by using the conventional.

Variables

The independent variable is the usage of e-collaborative learning model to enhance the teamwork of preservice teachers that the researcher developed. the dependent variable is learning achievement and the teamwork characteristics of learners who using e-collaborative learning model to enhance the teamwork of preservice teachers.

Research instruments

Research Instruments as the learning achievement test of course EDP3102 educational innovation and information technology, and the test of teamwork performance.

Data collection

The experiment of using e-collaborative model to enhance the teamwork of preservice teachers was done in real classroom of 38 undergraduate students, faculty of education,

Suansunandha Rajabhat University who registered course EDP3102 educational innovation and information technology in the first semester of 2019. the researcher used quasi experimental research by using two group pretest-posttest design as an experimental plan. the researcher conducted an experiment with 2 groups. Both groups had to be tested pretest. After an experiment, the first group is 38 students of Thai course, unit 001 who using e-collaborative model to enhance the teamwork of preservice teachers whereas the second group is 32 students of Thai course, unit 002 who using the conventional method. The experimental period was 1 semester. Then, posttest will be employed.

The test of educational innovation and information technology course was used as a pretest of experiment. The experiment using e-collaborative model to enhance the teamwork of preservice teachers was done in the first semester of 2020 for 16 weeks. Posttest was used to assess achievement result in the course of educational innovation and information technology. To assess teamwork performance of preservice teachers who learned by using e-collaborative method.

Statistical use

Finding statistical figures for learning achievement result of learners using e-collaborative model to enhance the teamwork of preservice teachers comparing to learning achievement result of learners using the conventional method by applying independent- sampling t-test. Finding statistical figures for analyzing which were mean and standard deviation.

RESULTS

The development result of the e-collaborative learning model to enhance teamwork of preservice teachers. The components of e-collaborative learning model to enhance teamwork of preservice teachers are as following:

1) Principle, concept, and theory of national development is required to develop national population to have high quality by developing learning model that is corresponding to governmental support, both appeared in Education Act 1999 and revised edition 2002 as well as related policies. Due to the rapid advancement in current information technology and telecommunications system, they are adapted to use in providing appropriate learning to learners' needs (learner-centric learning). Guidelines of providing learning consists of: Principle 1 providing student-centered learning. Instructor acts as knowledge resource, consultant, and advisor. Principle2 promoting students to involve in learning process by collaborating each other in planning, learning process control, self-assessment, electronic media usage support. This kind of media is a learning resource that provides various information and knowledge, we can use this resource to review knowledge by ourselves. Principle3 providing learning environment by allowing learners to practice working a team, leading to build knowledge and reflect the capabilities to adapt knowledge both theoretically and practically. Instructors enables learners to study in small groups, work collaboratively, have mutual responsibilities to attain mutual objective of the success in building new knowledge by coordinating and reflecting each other through electronic media and social networks. Principle4 authentic assessment of learning result is provided by allowing learners to collect works, assess results by themselves, and evaluate learning achievement by using tests in theoretical section. And principle5 instructors acts as provider of necessary basic knowledge and advice.

2) Goals and objectives of e-collaborative learning model to enhance teamwork of preservice teachers. the objectives of e-collaborative learning model to enhance teamwork of preservice teachers are as following: Objective1: to enable learners to gain higher achievement result in terms of knowledge, understanding, and knowledge adaptation. Objective2: to promote learners to have Characterized teamwork of preservice teachers.

3) Course content which used with e-collaborative learning model to enhance teamwork of preservice teachers. The content that is appropriate to this learning model should be course

which has theoretical section containing content highlight on teamwork and learners can create tasks by themselves. In this experiment, researcher selected to test with the course of Innovation and Educational Technology. The course content consists of principle, theory, technology and educational innovation, quality development of information technology learning, learning resource, social networks, software usage, problem analysis of using information technology innovation, and design of learning innovation.

4) Providing the activities of E-collaborative Learning Model. Instructors enables learners to study in small groups, work collaboratively, coordinate mutual responsibilities in order to attain mutual objective of building new knowledge. Learners communicate, coordinate, and reflect ideas through social networks which is learning using Teaching Technology.

The appropriateness of e-collaborative learning model to enhance teamwork of preservice teachers., specialist indicates that e-collaborative learning model is appropriate (IOC = 0.98). In the aspects of dimensions, every dimension is appropriate. Regarding principle, concept, theory, and course content (IOC = 1.00). Regarding goals and objectives, IOC equals to 0.95. Concerning the efficiency of E-collaborative Learning Model to enhance Teamwork of Preservice Teachers that researcher develops, $E_1/E_2 = 82.21/84.21$ shows that this learning model is efficient and can be used to attain research objective. Finding the efficiency of using e-collaborative model to enhance the teamwork of preservice teachers by providing sampling group of students to learn each lesson, then providing them a posttest. When learners studied all lessons, provided them posttest for assessing their achievement results. Then take results to find mean of pretest and posttest. The analytical result of the e-collaboration efficiency was shown in Table 1.

Table 1. *Indicates the analytical result of the efficiency of using e-collaboration model to enhance the teamwork of preservice teachers*

Activities during learning		Posttest		Efficiency
Number of learners	E_1	Number of learners	E_2	E_1/E_2
38	82.21	38	84.21	82.21/84.21

According to Table1, we found out that the efficiency of e-collaborative model to enhance the teamwork of preservice teachers equaled to $E_1/E_2 = 82.21/84.21$. Means of test score during studying in each lesson using e-collaborative model to enhance the teamwork of preservice teachers)E_1 (equaled to 82.21 and means of pretest score using e-collaborative model to enhance the teamwork of preservice teachers)E_2(equaled to 84.21. E_1/E_2 values indicated that e-collaborative model to enhance the teamwork of preservice teachers was efficient and practical corresponding to research objectives.

Table 2. *The comparison of learning achievement result of learners who learn through e-collaborative model to enhance the teamwork of preservice teachers and learners who learn through learning normal method*

Leaning Model	$\overline{X}$	S.D.	t	p-value
Using e-collaborative model	52.89	3.48	7.524	.005
Using learning normal method	43.00	7.32		

Table 2, achievement comparison of learners who learn through e-collaborative model to enhance the teamwork of preservice teachers and learners who learn through learning normal method indicated that there was significant achievement difference at the level of .05. We can summarize that e-collaborative model to enhance the teamwork of preservice teachers enabled learners to have higher learning achievement than the conventional model did.

Analytical results of performance of preservice teachers who learned with e-collaborative method teamwork as following Figure;
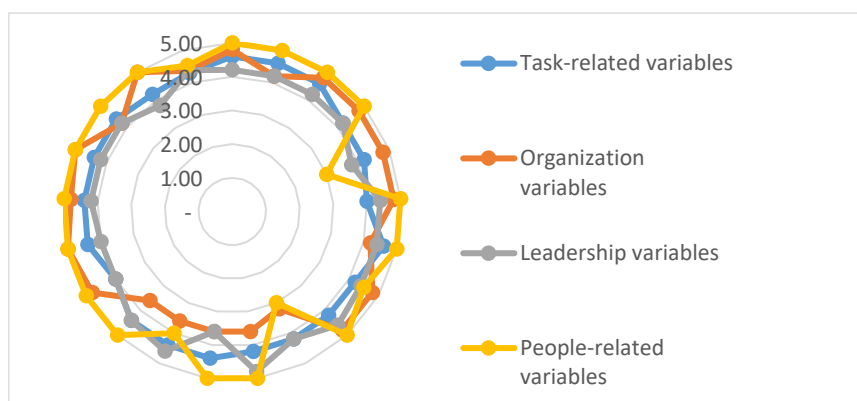

Figure 1. *Teamwork of learners who learned wıth e-collaboratıve model vıa electronıc learnıng*

According to Figure1, overall characteristics of teamwork of learners who learn with e-collaborative model via electronic media were rated at the highest level ($\bar{x}$ = 4.40, SD = 0.63). When we considered in each aspect, we found out that 3 aspects were rated at the highest level which were People-related ($\bar{x}$ =4.53, SD = 0.69), Leadership ($\bar{x}$ =4.39, SD = 0.71), and Organization ($\bar{x}$ =4.37, SD = 0.67), respectively whereas Task-related aspect was rated at high level ($\bar{x}$ =4.19, SD = 0.51). If we consider in details for each aspect, we found out as below.

Table 3. *Mean and standard deviation of teamwork of learners who learned with e-collaborative model via electronic learning*

Characteristics of Teamwork		$\bar{x}$	SD	Results
Task-related aspect				
1.	High-quality work production	4.08	0.43	High
2.	On-time finished work	4.13	0.74	High
3.	Work derived from creativity of team members	4.82	0.46	Highest
4.	Working by using knowledge skill and capabilities of each team member to build highest benefit	4.76	0.43	Highest
5.	Work used predetermined budget	3.18	0.51	Moderate
Overall characteristics of teamwork: Task-related aspect		**4.19**	**0.51**	**High**
Organization aspect				
6.	Organization Climate	4.34	0.71	Highest
7.	You involves in setting goals and determining objectives of doing mutual learning activities. (Policy)	4.58	0.64	Highest
8.	Work Procedure	4.37	0.71	Highest
9.	Regulations	4.34	0.71	Highest
10.	Organization Culture	4.21	0.47	Highest
Overall characteristics of teamwork: Organization aspect		**4.37**	**0.65**	**Highest**
Leadership aspect				
11.	Team members relies on you.	4.45	0.50	Highest
12.	Team members have faith in you.	4.42	0.68	Highest
13.	You can manage and order team members very well.	4.24	0.82	Highest
14.	Work environment facilitates decisions.	4.32	0.84	Highest
15.	You can stimulate work motivation leading to attain goals.	4.47	0.69	Highest
16.	You can analyze and handle every problem every time.	4.42	0.68	Highest
Overall characteristics of teamwork: Leadership aspect		**4.39**	**0.71**	**Highest**

Table 3. *(continue)*

	Characteristics of Teamwork	$\bar{x}$	SD	Results
	People-related aspect			
17.	Talk about several problems with other members liberally	4.58	0.68	Highest
18.	Communication with other members via electronic media	4.58	0.68	Highest
19.	Every team member is always willing to listen and consider comments from other members. (Team members' involvement)	4.53	0.73	Highest
20.	The competency of conflict management	4.47	0.65	Highest
21.	Friendly work environment	4.58	0.68	Highest
22.	Team members relies on each other.	4.45	0.72	Highest
23.	Team members have responsibilities for their assignment.	4.50	0.69	Highest
24.	Ultimate goal accomplishment	4.58	0.68	Highest
	Overall characteristics of teamwork: People-related aspect	4.53	0.69	Highest
	Overall characteristics of teamwork	4.40	0.63	Highest

The characteristic of teamwork in people-related aspect were rated at the highest level ($\bar{x}$ =4.53, SD = 0.69). When we consider in details for each topic, we found that every topic was rated at the highest level. Talk about several problems with other members liberally, communication with other members via electronic media, friendly work environment, and ultimate goal accomplishment had the highest mean ($\bar{x}$ =4.58, SD = 0.68), then followed by Every team member is always willing to listen and consider ideas from other members. (Team members' involvement) ($\bar{x}$ =4.53, SD = 0.73), Team members have responsibilities for their assignment ($\bar{x}$ =4.50, SD = 0.69), The competency of conflict management ($\bar{x}$ =4.47, SD = 0.65), and Team members relies on each other ($\bar{x}$ =4.45, SD = 0.72), respectively.

The characteristic of teamwork in leadership aspect were rated at the highest level ($\bar{x}$ =4.39, SD = 0.71). When we consider in details for each topic, we found that every topic was rated at the highest level. You can stimulate work motivation leading to attain goals ($\bar{x}$ =4.47, SD = 0.69) had the highest mean, then followed by Team members relies on you ($\bar{x}$ =4.45, SD = 0.50), You can analyze and handle every problem every time and Team members have faith in you ($\bar{x}$ =4.42, SD = 0.68), Work environment facilitates decisions ($\bar{x}$ =4.32, SD = 0.84), and You can manage and order team members very well ($\bar{x}$ =4.24, SD = 0.82), respectively.

The characteristic of teamwork in organization aspect were rated at the highest level ($\bar{x}$ =4.37, SD = 0.65). When we consider in details for each topic, we found that every topic was rated at the highest level. You involves in setting goals and determining objectives of doing mutual learning activities (Policy) had the highest mean, then followed by Work Procedure and Organization Climate ($\bar{x}$ =4.37, SD = 0.71), Regulations ($\bar{x}$ =4.34, SD = 0.71), Organization Culture ($\bar{x}$ =4.21, SD = 0.47), respectively.

The characteristics of teamwork in task-related aspect were rated at the high level ($\bar{x}$ =4.19, SD = 0.51). When we consider in details for each topic, we found that Work derived from creativity of team members was rated at the highest level ($\bar{x}$ =4.82, SD = 0.46) and working by using knowledge skill and capabilities of each team members to build highest benefit was rated at the highest level ($\bar{x}$ =4.76, SD = 0.43). On-time finished work was rated at the high level ($\bar{x}$ =4.13, SD = 0.74) and high-quality work production were rated at the high level ($\bar{x}$ =4.08, SD = 0.43). Work used determined budget was rated at the moderate level ($\bar{x}$ = 3.18, SD = 0.51), respectively.

DISCUSSION and CONCLUSIONS

The development of e-collaborative model to enhance the teamwork of preservice teachers consists of the following components. First component is principle, concept, and theory of national development that is congruent with governmental support, both is appeared in Educational Act 1999, 2nd revised edition 2002, other related policies, current information technology and communications

system. Learning is provided to be appropriate with learners' needs. Guidelines for providing learning consist of 2 principles. First principle: learner-centric learning, instructor acts as knowledge resource, consultant, and advisor. Second principle: learner involvement in learning process by providing them an opportunity to plan, learn, control learning process, and do self-assessment. In addition, the instructor encourages learners to apply electronic media as learning resources that provide various information and can be used to review knowledge by themselves. Third principle: providing learning environment that offers the opportunity for learners to practice as a team in order to build knowledge and reflect the capabilities to adapt knowledge both theory and practice. Instructors allows learner to work in a small group, do collaborative work, have mutual responsibilities, and reflect their ideas through electronic media and social network. Fourth principle: authentic assessment. Fifth principle: instructors provides essential fundamental knowledge and advice. Second component is goal and objectives. First objective: to enable learners to gain higher achievement result which covers knowledge, understanding, and knowledge adaptation. Second objective: to promote learners to work as a team. Third component is course content using e-collaborative learning model to enhance the teamwork of preservice teachers should be suitable with this learning model and this course should provide both theoretical and practical learning. Furthermore, this course should enable learners to create works by themselves. Fourth component is providing e-collaborative learning model by making learners to learn together in small groups, do collaborative work, have mutual responsibilities to attain same objectives of building new knowledge, and reflect their ideas through social network, which is learning by using teaching technology. Specialist expresses an opinion that e-collaborative learning model is appropriate due to IOC value equaling to 0.98. E-collaborative learning model is appropriate in every aspect. Regarding principle, concept, theory, and course content, IOC equals to 1.00. Regarding goal and objective, IOC equals to 0.95. E-collaborative learning model to enhance the teamwork of preservice teachers is efficient as we noted from E_1/E_2 = 82.21/84.21 and can be used in congruent with research objectives,

In the aspect of e-collaborative learning model to enhance the teamwork of preservice teachers to the conventional method, we found out that achievement result of learners who using e-collaborative learning model to enhance the teamwork is significantly different from achievement result of learners using the conventional method at the level of .05. We can summarize that e-collaborative learning model to enhance the teamwork of preservice teachers enable learners to obtain higher achievement result than the conventional method.

Analytical result of overall characteristics of teamwork of learners who learn with e-collaborative model via electronic media were rated at the highest level. When we considered in each aspect, we found out that 3 aspects were rated at the highest level which were People-related, Leadership, and Organization whereas Task-related aspect was rated at high level. Overall characteristic of teamwork in People-related aspect were rated at the highest level. When we consider in details for each topic, we found that every topic was rated at the highest level. Talk about several problems with other members liberally, communication with other members via electronic media, friendly work environment, and ultimate goal accomplishment had the highest mean, then followed by Every team member is always willing to listen and consider comments from other members (Team members' involvement), Team members have responsibilities for their assignment, The competency of conflict management, and Team members relies on each other, respectively. Overall characteristic of teamwork in Leadership aspect were rated at the highest level. When we consider in details for each topic, we found that every topic was rated at the highest level. You can stimulate work motivation leading to attain goals had the highest mean, then followed by Team members relies on you, You can analyze and handle every problem every time, Team members have faith in you, Work environment facilitates decisions, and You can manage and order team members very well, respectively. Overall characteristic of teamwork in Organization aspect were rated at the highest level. When we consider in details for each topic, we found that every topic was rated at the highest level. You involves in setting goals and determining objectives of doing mutual learning activities (policy) had the highest mean, then followed by Work Procedure and Organization Climate, Regulations, Organization Culture,

respectively. Overall characteristics of teamwork in Task-related aspect were rated at the high level. When we consider in details for each topic, we found that Work derived from creativity of team members was rated at the highest level and working by using knowledge skill and capabilities of each team members to build highest benefit was rated at the highest level. On-time finished work was rated at the high level and high-quality work production were rated at the high level Work used determined budget was rated at the moderate level.

This research can be brought to discussion according to logical principle. The e-collaborative learning model to enhance the teamwork of preservice teachers was developed by using principle, concept, theory, and development of national population, that is congruent with governmental support. Information technology and communications system were appropriately adopted to learners' needs. This creates learning intention, lessen-learned recollection, learning consultation, and learners' expression support (Gagne, Wager and Golas, 2005) by focusing on Learners' needs according to learning design principle by the concept of Brown et al. (1983: 3-15). Learning environment of e-collaborative learning model is provided for positive dependence. Individual has responsibility to build their own knowledge [(Johnson & Johnson, 2009). Instructor allows learner to work as a team to build knowledge and reflect capabilities to adapt knowledge, both theoretical and practical form. Instructor allow learners to work in a small group, do collaborative work, have mutual responsibilities, and reflect their ideas through electronic media and social network. Then, instructor provides authentic assessment and essential fundamental knowledge and advice, which is principle and concept of teamwork, a part of strategic methods of active learning. (Fink, 1999: 1-2; Meyers & Jones, 1993: 19-20). Achievement result of learners who using e-collaborative learning model to enhance the teamwork is significantly different from achievement result of learners using the conventional method at the level of .05, based on predetermined hypothesis. We can summarize that e-collaborative learning model to enhance the teamwork of preservice teachers enable learners to obtain higher achievement result than the conventional method. This summary is corresponding to the research of Suwapat Srikussop (2015) relating to providing active learning through social network: case study in the course of design operation code 2501117. Research result indicates that active learning through social network will help promote and stimulate learners to access and understand content easily and accurately. We will find that e-collaborative learning partly supports learners' study. Regarding the research of Thanatnut Chatphukarat (2015) relating to active distance e-learning development in developing problem-solving capability for undergraduate students of Sukhothai Thammathirat Open University, research result showed that students who learn through active distance e-learning have significantly higher capability to solve problems at the level of .05. This is congruent with the research of Watzek, Anselmann, & Mulder (2019) relating to learning through teamwork and emotion and feeling during working as a team: qualitative education.

This research is in-depth research to observe team's participation of learning activities, social reaction, and emotion in working as a team, as well as the relationship of team members. According to assessment of working as a team and emotions during working as a team, the research shows that every team member participates in learning activities of learning as a team, which consist of experience sharing and work thinking. Therefore, e-collaborative learning model to enhance the Teamwork can help develop learners to know experience sharing and increase their skills to think for their work.

The results of this research indicated that overall characteristics of teamwork of learners who learn with e-collaborative model via electronic media were rated at the highest level. When considering each aspect, it was found that the overall characteristics of teamwork of learners of 3 aspects were rated at the highest level, which were People-related, Leadership, and Organization respectively, while Task-related aspect was rated at a high level. And when considering each aspect, people-related aspect was rated at the highest level. The research result showed that all team members involved in team learning activities, such as sharing their experiences and thinking about work. The researcher also observed the social emotional reaction of team members in the field of solidarity, jubilation, and tension, which were positive social and emotional reactions. The analytical

results of the overall characteristics of teamwork in leadership aspect of the experimental group was rated at the highest level. It can be concluded that the e-collaborative learning model to enhance Teamwork of Preservice Teachers can be used in learning management to develop learners in work, which is one of the important qualities of working with others in the teaching profession. Therefore, it can be said that E-collaborative Learning can help develop learners to share experiences and increase thinking skills in order to work by themselves, which is a necessary characteristic of teamwork of personnel in all professions.

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