

Professional experience teacher training based on creative thinking competency using the KWSLPA learning model

Nutchanat Chumchuen^{1,*}, Somsak Akatimagool¹, and Mongkol Wangsathitwong¹

¹Department of Teacher Training in Electrical Engineering, King Mongkut's University of Technology North Bangkok, Bangkok, Thailand

Abstract

The purposes of this research were 1) to develop a learning and teaching process based on creative thinking competency using the KWSLPA learning model, 2) to evaluate performance of the developed teaching process by implementing in professional experience course to train pre-service teachers, and 3) to evaluate students' satisfaction towards learning using the developed KWSLPA learning model. Theoretical research has revealed a gap in teaching methods as creativity relates to teachers' competency. Research studies related that the KWSLPA learning model and the measurement of creativity using various activities has provided insight into learning processes. These works have pointed to teacher training, integrating between active learning model and creativity through the developed KWSLPA instructional package. Thus, this study concludes by presenting the KWSLPA learning model with a rubric to evaluate creativity. The performance (E1/E2) of the developed learning model was found to equal 72.35/81.15 which performance (E1) is lower than the standard criterion of 80/80, while the overall evaluation of creativity was equal to 81.67%, and the mean of satisfaction of the sampling group was also at a high level. This means students had a high competency and performance was achieved successfully.

Keywords: professional experience teacher training, creative thinking, KWSLPA learning model

Article history: Received 31 October 2017, Accepted 8 December 2017

1. Introduction

Learning and teaching in higher education focuses on providing students with three knowledge skills, cognitive, affective and psychomotor domain which helps them to develop into a skilled career. The development of high human resources can encourage and support the growth of a country. The office of higher education commission has an important role to develop knowledge and skill both theoretically and practically. In the 21st century educational field, learners should be able to improve their skills and solve problems using professional experience training as efficiently [1]. Presently, education is important to provide students with theoretical and practical knowledge to achieve expertise and creative thinking to solve various problems in real life situations [2]. Considering articles from the teacher's council of Thailand on professional standards of 2013, the first category of knowledge and professional experience in article 11 said that "professional teachers require teaching activity standards to encourage students to be able of critical thinking by emphasizing permanent creativity outcome into the learner". Therefore, professional teacher training in higher education is a critical need to develop students with the ability of creativity alongside other essential skills.

Research Objective

1) To develop learning and teaching process based on creative thinking competency using the KWSLPA learning model.

2) To evaluate performance of the developed teaching process using the KWSLPA learning model.

3) To evaluate students' satisfaction towards learning using the developed KWSLPA learning model.

Scope of the research

1) Efficiency of the developed teaching process based on creative thinking competency using the KWSLPA learning model which must be equal to or exceed the standard criterion of 80/80.

2) Students' satisfaction in the learning using the developed KWSLPA learning model must be at a high level of satisfaction.

2. Materials and methods

2.1 The KWSLPA learning model

The KWSLPA learning model [3] is based on creative thinking competency which was developed and improved using the KWL learning model of Oga I. Koroleva (1986), constructionism theory and Bloom's taxonomy of learning [4 - 6]. The theoretical concept associated with the KWSLPA learning model is self-knowledge theory based on the creative thinking competencies via various teaching media and

*Corresponding author; e-mail: nutchanatncc@hotmail.com

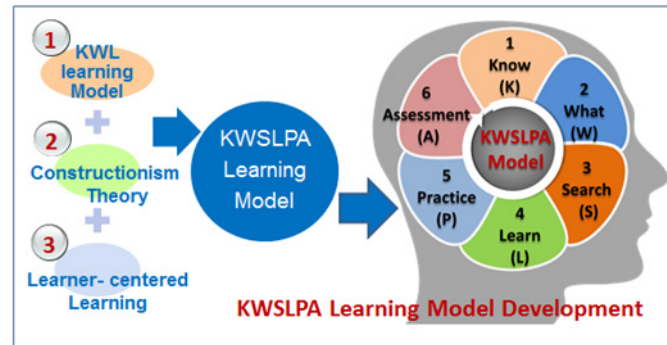


Figure 1 Conceptual design of the KWSLPA model

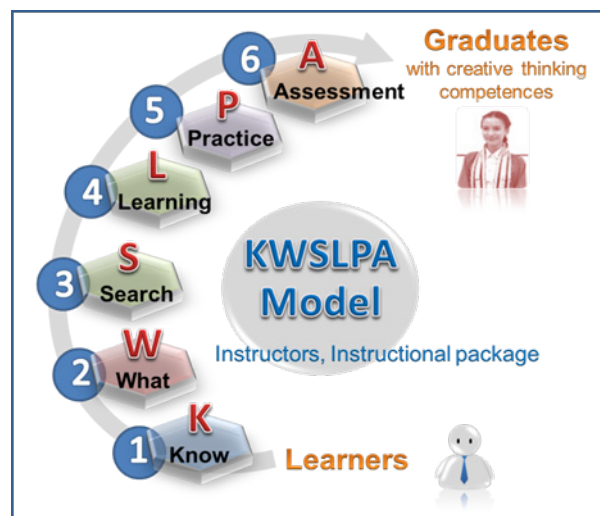


Figure 2 KWSLPA learning model

The KWSLPA learning model consists of 6 processes as; Know (K), What (W), Search (S), Learn (L), Practice (P) and Assessment (A) as shown in Figure 2. The details in each process are as follows. modern technology applications [7], as shown in Figure 1.

1) Know (K) is a process of basic knowledge preparation which instructors review and quiz the present knowledge of the learner. Learning activities consist of brainstorming and review of present knowledge and determining conceptual mapping of essential knowledge.

2) What (W) is a process to define the learning purposes, learning activities which learners want to learn or improve. The teacher and learners will define conjointly the learning issues and conduct brainstorming to find answers or new knowledge.

3) Search (S) is a process of ascertaining the required information. Students are encouraged to find more knowledge from various sources that are found both inside and outside of the classroom.

4) Learn (L) is a process of learning within the classroom, the instructors teach and carry out recall

information. Students will gain information and knowledge which has already been concluded.

5) Practice (P) is the practical learning process. Students take the learnt information to generate practical solutions or create innovations. Teachers will serve to assign students to conduct part-time work and send comeback projects as scheduled.

6) Assessment (A) is the process of summary and presentation of contents to be studied. The contents are discussed, concluded and presented according to learning activities. This step requires a clear roadmap. The teachers must have appropriate guidelines to assess of students' competencies.

The advantage of the KWSLPA learning process is promoting and developing learning behavior of pre-service teachers in engineering education to have highly creative thinking competency using constructionism theory and learning by doing principle. The concept of the KWSLPA model is suitable to the CDIO method [8] that encourages students to have various competencies, such as understanding, analyzing problems, improving practical skills and developing creative potential and the SSCS model that is learning process based on the solving problem skills [9].

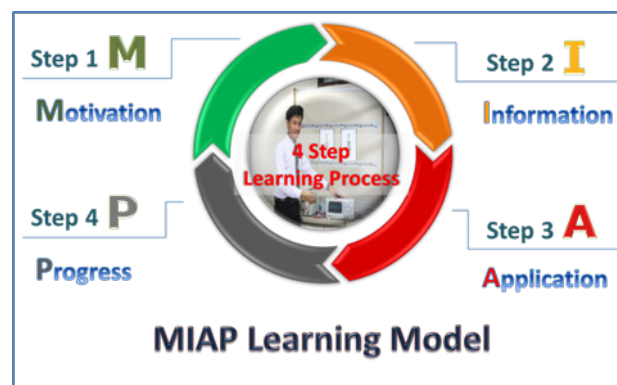


Figure 3 MIAP learning model

2.2 Creative Thinking

Creativity is linked to fundamental qualities of thinking, such as flexibility and tolerance of ambiguity. The evaluation of creative problem-solving skill will measure learners' attitude towards problem-solving [10]. Scoring comprises of four competencies [11] including originality, fluency, flexibility, and elaboration. The detail of creative thinking competencies is presented as follows.

1) Originality: the uniqueness or novelty of ideation is measured as the number of novel ideas. The statistically different or novel ideas are then compared by a comparison group.

2) Fluency: the speed of ideation is measured by the total number of ideas generated. Fluency captures the ability to come up with many diverse ideas quickly.

3) Flexibility: the breadth of ideation is measured by the number of different categories of ideas generated. Flexibility captures the ability to cross boundaries and makes remote associations.

4) Elaboration: the depth of ideation is measured by considering the amount of detail associated with the idea. It is not relevant to the definition of creativity, but elaboration has more to do with focusing on each solution or idea and developing it further.

The above creative elements can promote students to have divergence ideas for professional learning and surviving in society. In addition, Gordon [12] has said that creativity is a learning skill that can be used to promote society development, and to solve various problems effectively in everyday life. Creativity can be trained from various learning activities, such as group activities [13], brainstorming, training of imagination, training of comparison [14], techniques of six thinking hats [15].

2.3 The MIAP Learning Process

In the training of pre-service teachers for the department of teacher training in electrical engineering, Faculty of Technical Education at King Mongkut's University of Technology North Bangkok (KMUTNB), the instructional system must implicit teaching

processes, developed by German and Thai teacher experts [16] since 1975 called the MIAP learning model. The MIAP learning process consists of 4 processes of a basic learning thinking system, as shown in Figure 3.

The MIAP learning model includes four teaching stages [16] as,

1) Motivation: The task is given to follow the relevant content objective. The learner will be stimulated to learn interesting topics. A learning process is motivated if a person must do something, or wants to do something, which they have not yet done, or can do. This first step, described as MOTIVATION, is marked by two factors as follows, a problem (learning exercise) exists, and the wish to solve the problem is present.

2) Information: The information necessary to solve the task is conveyed, developed and found. If a person is motivated to learn, he/she must first ask, receive and digest information which can be relevant to the solution of the given problem. With this learning step, described as INFORMATION, the necessary information for the solution of the task is collected.

3) Application: The gathered information is applied by the learner to solve the task. The collected information is used to solve the problem. This step, described as APPLICATION, is marked by the fact that the student himself applies, tries and uses the collected information to solve the problem.

4) Progress: The success, or otherwise, of the solution is measured. The learner is informed to promote the success. A learning process is complete when the person experiences that the task has been successfully solved. This step is described as PROGRESS.

3. Research methodology

The research in this paper is a quasi-experimental method to develop creativity through the use of a KWSLPA learning model in the teaching of the professional experience teacher training course. The research methodology consists of processes as to

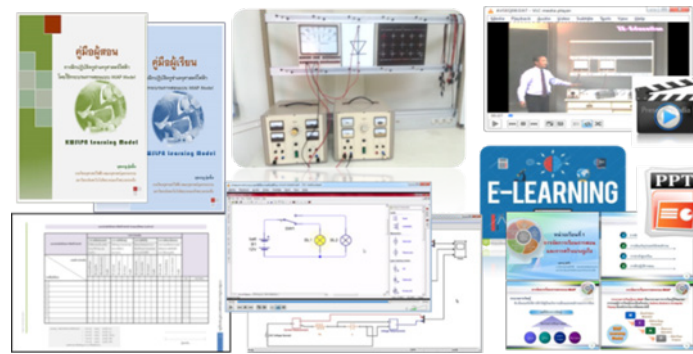


Figure 4 Research Instrumentations

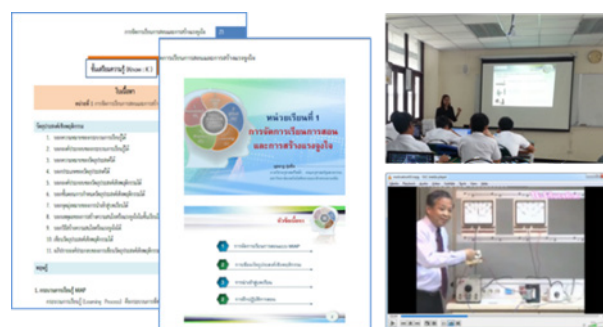


Figure 5 Learning step of know (Know: K)

analyze the curriculum of professional experience teacher training course, to develop the instructional package using the developed KWSLPA learning model, to implement the research tool using the teaching and learning in real classroom, to analyze data and conclude the research.

3.1 Research Tools

1) The instructional package using the KWSLPA learning model in the teaching of the professional experience teacher training course consisted of teacher's guide, learning activity plan, instructional aids such as power point presentation, video clip, demonstrational set, simulation program, e-learning, social media and quizzes, as shown in Figure 4.

2) The evaluation forms of creative thinking competency using the assessment rubric score. Scoring is comprised of four components: originality, fluency, flexibility, and elaboration competencies.

3) The achievement test is based on multiple choice test of 60 points.

3.2 The research process

The research processes in the teacher training of professional experience teacher training course are as follows,

1) The experimental research based on creative thinking competency using the KWSLPA learning model was implemented using 24 students' samples of the 2nd year level in academy year 2016 of bachelor

degree in professional experience teacher training course, which were purposively selected from the Department of Teacher Training for Electrical Engineering, Faculty of Technical Education at King Mongkut's University of Technology North Bangkok.

2). In the learning and teaching first step, the teacher will introduce the learning processes using the KWSLPA learning model to the students.

3) The KWSLPA learning processes were implemented in four hours over four academic weeks. During the teaching of each lesson, teachers observed and evaluated the students' learning behaviour.

4) After teaching of each lesson, students have to take a test. The learning process, knowledge, teaching skills, creativity competency of students was evaluated using achievement tests and evaluation forms, activities in learning and teaching using the KWSLPA learning model are as follows.

(1) Preparation of knowledge (Know step: K) contains learning activities such as reviewing knowledge, adjustment of basic knowledge and summary, as shown in Figure 5.

(2) The process of learning (What step: W) contains learning activities such as determining knowledge, group brainstorming, analysing of the problems and issues, and retrieving knowledge, as shown in Figure 6.

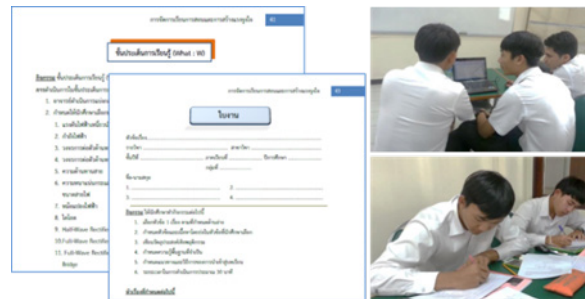


Figure 6 Learning step of what (What: W)



Figure 7 Learning step of search (Search: S)



Figure 8 Learning step of learning (Learning: L)



Figure 9 Learning step of practice (Practice: P)

(3) The process of learning (Search step: S) contains learning activities such as defining the scope of learning, brainstorming and searching for information from various sources, as shown in Figure 7.

(4) Stages of learning (Learning step: L) includes learning activities, the learning and teaching, brainstorming and summary of content, as shown in Figure 8.

(5) Process of practice (Practice step: P) consists of learning activities such as work practice,

working in a team, discussions, presentation and summary of knowledge, as shown in Figure 9.

(6) The assessment and evaluation (Assessment step: A) includes a quiz, test, measurement and evaluation. The knowledge gain was then evaluated, as shown in Figure 10.

5) Finally, the overall learning achievement and satisfaction of students were measured and evaluated using educational statistics, as shown in Figure 11.



Figure 10 Learning step of assessment (Assessment: A)



Figure 11 Students take the examination.

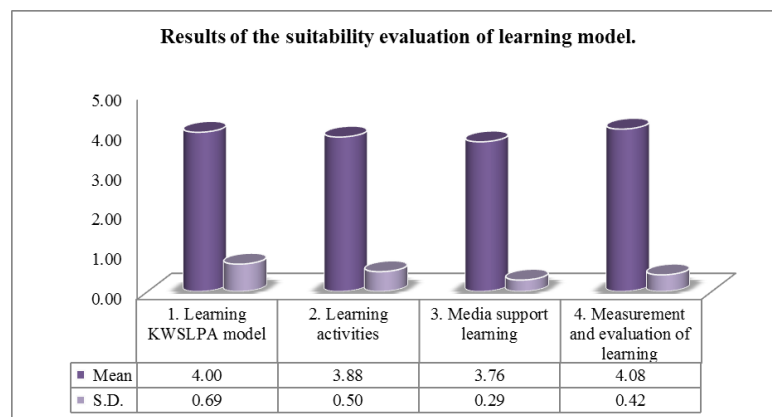


Figure 12 Results of the suitability evaluation of learning model

4. Research results

The research results of the KWSLPA learning model development based on creative thinking competency are presented as follows.

4.1 The suitability of the developed KWSLPA learning model is displayed in Figure 12. The result found that the suitability of the developed KWSLPA learning model was at a high level (mean equal to 3.93) by 5 experts [3].

4.2 Evaluation of Creative Thinking Competency.

The students' creative thinking competencies using rubric standard benchmark of four competencies [11], [17] were namely originality, fluency, flexibility, and elaboration as presented in Table 1. It can be seen that the overall competencies of students' creative thinking were equal to proximally 81.67% (equalled to 4.08 of 5 maximum points) that means students have a high competency performance.

4.3 Evaluation of Performance of Learning Model.

The teaching and learning assessment using the KWSLPA learning model used various evaluation tools composed of a knowledge test at 60 %, creative thinking competency score at 30 %, and students' attitude at 10 %. After experimenting with the 2nd year students at bachelor degree level in a professional experienced teacher training course, it was found that the average performance of learning process during the learning of each lesson (E1) equalled 72.35% and the overall learning achievement (E2) equalled 81.15%, as shown in Table 2. The efficiency of the developed KWSLPA learning model was lower than the standard criterion of 80/80. However, it can be seen that the developed KWSLPA learning model can be used in teaching and learning to promote students to have more knowledge and professional competencies.

Table 1 Creative thinking competencies

Creative thinking score	Mean value (max 5 points)	Performance (100%)
Originality	3.61	72.22
Fluency	4.89	97.78
Flexibility	4.33	86.67
Elaboration	3.50	70.00
Total average score	4.08	81.67

Table 2 Performance of teaching process and learning achievement

Evaluation for 24 students	E1	E2
Achievement test (60%)	40.29	47.36
Creative thinking competency test (30%)	22.52	24.08
Attitude test (10%)	9.54	9.71
Total (100%)	72.35	81.15

Table 3 Evaluation of students' satisfaction

List of assessment	Mean	S.D.	Level
1. Environment of learning	4.45	0.62	High
2. Learning activities	4.47	0.66	High
3. Teaching and learning management	4.42	0.69	High
4. Instructional media (Power Point presentation, Video, etc.)	4.57	0.62	Very high
5. Measurement and Evaluation	4.48	0.66	High
Total Average	4.48	0.43	High

4.4 Evaluation of Students' Satisfaction.

The satisfaction in the learning and teaching of professional experience course using the developed KWSLPA learning model was evaluated using 24 students, as shown in Table 3. The evaluated result showed that the mean satisfaction equalled 4.48 from a maximum of 5 points, and S.D. equalled 0.43, which means students were at a very high satisfaction level when learning with the developed KWSLPA learning model.

5. Conclusion

Learning and teaching based on creative thinking competency using the KWSLPA learning model was presented in this research focusing on professional experience courses to train the pre-service teachers. The research results found that students were satisfied with the teaching method using the KWSLPA learning model and felt excited to participate in various activities. In the overall finding, the learning achievement (E2) of students was consistent to the expected standard criterion and the developed KWSLPA learning model can promote students to have more knowledge and professional competencies. Moreover, in managing the appropriate classroom

environment, such as student-centered learning process, various learning activities, modern educational instruments, team working, exchanging knowledge, and etc., it can successfully encourage students to have highly creative thinking competencies.

This research suggests that creative thinking competency is the highest learning step of Bloom's Taxonomy which is important in the professional career of the pre-service teachers. Because the pre-service teachers must have techniques or strategies to teach students with different backgrounds, they must be able to solving problem and teaching knowledge as efficiently and quickly. Moreover, the creativity competences encourage instructors to design more diverse and exotic learning approaches according to the vision of Faculty of Technical Education of KMUTNB which stated that "learning organizations and master of engineer teachers must balance morality with creative research and invention". Thus, in managing learning and teaching through teacher training process, it is necessary to develop various learning activities that is consistent with 21st century educational skills and have to integrate both functional and professional competencies using the

KWSLPA learning to encourage students to have more creative thinking skills.

References

- [1] Kawano A, Isogai E, Aoyama M. A model and evaluation method of learning motivation in the education and training of professional engineers. **Proceedings of IEEE International Conference on Teaching, Assessment, and Learning for Engineering (TALE)**; 2016: 311-318.
- [2] Shen TL, Lai JC, Tsai MC. The performance and impact of applying lotus blossom technique in teaching on creative problem solving. **Proceedings of International Conference on Advanced Materials for Science and Engineering (ICAMSE)**; 2015: 614-617.
- [3] Chumchuen N, Akatimagool S, Wangsathitwong M. The development of KWSLPA learning model based on creative thinking competency. **Proceedings of the 3rd International Conference on Technical Education (ICTechEd. 2015)**; 2015:15-18.
- [4] Anderson LW, Krathwohl DR. **A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives**. Boston: Allyn & Bacon; 2001.
- [5] Bloom SB. **Taxonomy of education objectives handbook I : Cognitive domain**. New York: David McKay Company; 1956.
- [6] Krathwohl DR. A revision of Bloom's taxonomy. **Theory and Practice** 2010; 41: 37-41.
- [7] Haddad WD. **Technologies for education**. Washington DC: Academy for Educational Development; 2002.
- [8] Zhang L, Wang L. Research on CDIO engineering education pattern microelectronics technology-driven teaching method. **Proceedings of International Conference on Education Technology and Information System (ICETIS 2013)**; 2013:416-420.
- [9] Mathasit T. The development of mathematics' problems solving skills. Applications of linear equations for mattayomsuksa 1 students in mathematical genius program (GIFTED MATH) in Benjamarachutit School, Ratchaburi by SSCS model. **Journal of Thai Interdisciplinary Research** 2014; 9(1): 61-69.
- [10] Guilford JP. **The nature of human intelligence**. New York: McGraw – Hill; 1967.
- [11] Giouvanakis T, Kehris E, Samara H, Mpakavos S. A framework for supporting creative thinking in concept mapping. **Proceedings of IEEE 14th International Conference on Advanced Learning Technologies**; 2014: 493-494.
- [12] Gordon WJJ. **Synectics: The development of creative capacity**. London: Collier-MacMillan; 1961.
- [13] Dewey J. **How we think: A restatement of the relation of reflective thinking to the educative process (1910)**. Boston: Heath; 1933.
- [14] Gordon R. A curriculum for authentic learning. **The Education Digest** 1998; 3: 4-8.
- [15] Bono DE. **Six thinking hats**. Cambridge: Little, Brown and Company; 1956.
- [16] Wagener WE. **Model for practical-educational counterpart training**. Stuttgart: German Agency for Technical Cooperation Ltd; 1975.
- [17] Mcdaniel R, Fanfarelli JR, Lindgren R. Creative content management: Importance, novelty, and affect as design heuristics for learning management systems. **IEEE Transactions on Professional Communication** 2017; (16): 1-18.