



Research Article

Enhancing Innovative Thinking of Thai Pre-service Teachers through Multi-educational Innovations

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Abstract

Disruption education is now affecting to learning environments and its changes make education reforming. Learning competency in this era should be enhanced in thinking skills and creating innovation to society. This research aims to enhance innovative thinking of Thai pre-service teachers. Participants were 128 Thai pre-service teachers who enrolled in the second semester in the academic year 2018 from a university in the northeast of Thailand. Research tools consisted of observation form, interviewing form, and open-ended questionnaires. Participants were divided into 3 groups by large, small, and individual learning. Data were collected and analyzed by qualitative and quantitative explanations and some remarks in the implementation period. Six steps of learning activities consisted of setting goals, brainstorming, innovation design, reflection, teaching strategies, and evaluation. Also, educational innovation had 5 components: instructional media, guideline, online link, application technology, and lesson plans. Instructional media were modeling, 3D pop-up, paper mache, slide card, diagram, digital media and electronic book. The innovative thinking of large group learning showed the highest score, pop-up fit to small group learning, and digital media was suitable for individual learning.

Keywords:

thinking, group learning, learning tools, teacher development, innovation

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Introduction

Learning management in the 21st Century are shaped by many factors and seemed to be different from than previous educational development. Digital media and internet growing are rapidly developed in terms of digital sources, for example: social media online, new applications, learning tools, web development and other tools (Simmie & Lang, 2012). The necessary learning skills are increasingly recognized for children preparation in the future. Thinking is an important skill for youngsters in new age of learning, skills for solving problem, making connection to career development (Burnard & Younker, 2004; Cremin et.al., 2006; Craft et.al., 2007; Wechsler et.al., 2018). Good teaching is not in content focuses, but the lessons that will help students are able to learn in the new the methods and tools of applications. Therefore, learning management focuses on that thought process, development of innovation, and applying technology in appropriately. Moreover, it is constantly changing as a result of a problem in the multi-level sector. That is, the creation of product to response new life style, and also traditional products will soon be replaced with a new product development through transformation (Bellanca, 2010).

For this reason, if humans lack the skills for innovation to makes it impossible to compete in the economy sector, because it will not be able to develop or create a product instantly by the popularity of the consumer (Obeng, 2019). It is important to make a difference in the 21st century success by the traditional methods (Lee & Benza, 2015). The original format did not work and was not as popular for new youngsters. The ability to create innovations is necessary in a competitive era. Thinking skill should be encouraged to happen with human skills, innovation, and product of innovative thinking (Weiss & Legrand, 2011). If students have innovative thinking, they will be able to solve problems, design and innovate a successful life. Innovative thinking is therefore a skill that is important to sustaining human life because it will lead to innovations, lead to the development, solve the problem, and make social progress (Wheeler, 2006). So that, students can create and develop product for daily lives.

Teacher is a person who plays an important role in the development of students' growing into a complete human being. Teachers are key elements to change and scaffold students to meet the goals of education, and also requirements of preparation of 21st century citizens. They should have ability to design and create the contemporary concept in education, refers to the ability of students and to figure out a way to develop innovations (Klaeijsen et.al., 2018). Teachers bring a variety of innovation to students with the fascinating experiences through curriculum and learning activities (Suryawati & Osman, 2018). By having a teacher to observe throughout the event and the ability to estimate success or no success of innovation after the perceive experience. Pre-service teachers are able to design

instruction that attract attention and stimulate the interest to students (Prachagool et.al., 2016; Nuangchalerm & El Islami, 2018). They can build the knowledge and skills that will result in the students in thinking designs. That is, will lead students towards success in life as well as live together in the world of changing (Hart, 2013).

Innovative thinking is to innovate or develop prosperity for the society. By this new thing might not have ever had anyone had ever done it before or have done in the past but have been restarted, or what this new development comes from the old existing (Wu et.al., 2018), it successfully occurred as a result of new production (Ekanem, 2016). Innovative thinking is now called for many levels of education. The development of innovative thinking based on the ability to analyze the context (interpret) the ability to create (generate) concept, the ability to cooperate with others (collaborate) the ability to reflect (reflect) a forest can be in the present (represent), and the ability to assess (evaluate). That is, the foundation of concept to enhance innovative thinking for pre-service teachers. Innovative thinking can promote by collaborative learning (Wu et.al., 2013), learning from experiences (Kolb, 2014; Zidulka & Kajzer Mitchell, 2018), technology in education (Nussbaum-Beach & Hall, 2012; Shekar, 2014; Garrison, 2015; Collins & Halverson, 2018), project-based learning (McCormack, 2019; Warnock & Duncan, 2019), online collaborative learning (Roberts, 2004), inquiry-based learning (Nuangchalerm, 2014; Coffman, 2017), and technology education for teachers (Williams, 2013).

Multi-tool of learning in such technology in education help to promote learning management skills, innovation, and collaboration skills, students discover collaborative learning using technology in learning and learning the design burden will help to promote innovative thinking skills. Students in higher education are that should be handled through teaching, collaborative learning and experience (Hart, 2013), learning styles, appropriate instruction and management are causing skills to create innovations is a project-based learning (Pearlman, 2010), which is a very important key in the development of innovations. By having a basic theory concepts comes from the 4 concepts include: 1) the concept of teaching through experience or experiential learning (Kolb, 2014), collaborative learning (Barkley et.al., 2014), project-based learning (Bender, 2012), and technologies for education (Edwards, 2012). Innovative thinking of pre-service teachers is aiming to investigate and seek the way to enhance as well as teacher preparation program required. Teachers need to arrange and design suitable situation to students. Engaging them to face with the problem situation, learn from differences, collaborate with others, group design in solving. Learning activities is practical and action oriented, providing students with practical experience occurs. Students can apply the knowledge in the application of technology to solve the problem. There

should be a reflection of the thinking about the experiences that happen and encourage them to help each other, exchange ideas, and shared responsibilities.

Research Problems

To education reform and Education 4.0, the learning management required the innovative and productive instruction. Authors formulated research problems were; (1) What is the model for enhancing innovative thinking through multi-educational tools that pre-service teachers can employed to their classroom?; (2) What are educational innovation based on learning group will enhance innovative thinking of pre-service teachers?

Method

Research Model

This research employed research and development (R&D) (Mahdjoubi, 2009) to develop educational innovations of pre-service teachers. Four phases of research was conducted by i) R1: critical reviews on innovative thinking and multi-education innovations from reliable online databases, ii) D1: developed multi-education innovations supporting thinking designs of pre-service teachers, iii) R2: implemented multi-education innovations to pre-service teachers, iv) D2: Improve multi-education innovations as well as suitable for innovative classroom.

Participants

In the study, participants were 128 Thai pre-service teachers who enrolled in the second semester in the academic year 2018 from a university in the northeast of Thailand.

Data Collection Tools

Critical reviews on innovative thinking and multi-education innovations from reliable online databases. A systematic review through online databases, university library databases, and studies the preliminary synthesis of Thai educational standard and framework for 21st century learning was conducted. Then, developing multi-education innovations supporting thinking designs of pre-service teachers by using a concept for define educational innovation and four concepts for define instructional practices, the design and innovations were approved by 5 educational experts. Finally, participants were Thai pre-service teachers. The steps of instructional practices consisted of 6 steps: setting goals, brainstorming, innovation design, reflect, teaching and evaluation for 36 lesson plans in class's pre-service teachers. Each step of teaching model using data collection Tools: lesson plans, observation form, interviewing form, and open-ended questionnaires. Participants were divided into 3 groups by large, small, and individual learning.

Data Analysis

Data were collected through qualitative and quantitative explorations. Most qualitative information was employed in the first phase of critical reviews. Then, findings were generalized to the innovation development by setting multi-educational innovations for pre-service teachers. The quantitative information were gathered and analyzed by descriptive statistics for supporting qualitative data in the previous phases.

Results and Discussion

Innovative thinking can be promoted to pre-service teachers had 6 steps: setting goals, brainstorming, innovation design, reflect, teaching, and evaluation (Table 1). The foundations of innovative thinking should have creatively, problem-solving, and new to community. Critical reviews guided the ways to enhance pre-service teachers in new learning environments by applying technology and make collaboration in the classroom. They also inquire contents to fit with pedagogical strategies as well as nature of learning.

Table 1.

Data Source, Concepts and Principles to Definition of Educational Innovations

Data source	Concepts and Principles	Definition
1. Online databases: ProQuest 23 papers, ERIC 18 papers, Springer 21 papers, Science Direct 19 papers, Google Scholar 25 papers, and researchgate 22 papers	1. educational innovation (Simmie & Lang, 2012)	educational innovation were innovations for teaching developed by pre-service teachers
2. University libraries: Chulalongkorn University in Thailand, National Institute of Education (NIE) in Singapore, and University of Tasmania in Australia	2. instructional practices from critical reviews found 4 concepts developing innovation (Australia Government, 2009)	instructional practice to enhance educational innovation had 6 steps:
3. Need studies: Preliminary studies (Wisetsat, 2019), Synthesis Thai Educational Standard (Ministry of Education, 2018), and Framework for 21 st century learning (Bellanca, 2010)	online collaborative learning (Roberts, 2004) inquiry-based learning (Nuangchalerm, 2014; Coffman, 2017) technology education for teachers (Williams, 2013)	step 1 setting goals step 2 brainstorming step 3 innovation design step 4 reflect step 5 teaching step 6 evaluation

Table 1 presented that educational innovation were innovations for teaching developed by pre-service teachers. It needs integration between contents, pedagogy, and technology into classroom. The synthesis of literatures can develop innovative strategies into 6 steps: step 1 setting goals, step 2 brainstorming, step 3 innovation design, step 4 reflect, step 5 teaching, and step 6 evaluation. The critical reviews lead researchers to critically construct a development process as in Figure 1. Then model for enhancing innovative thinking through multi-educational tolls for pre-service teachers was approved by educational experts.

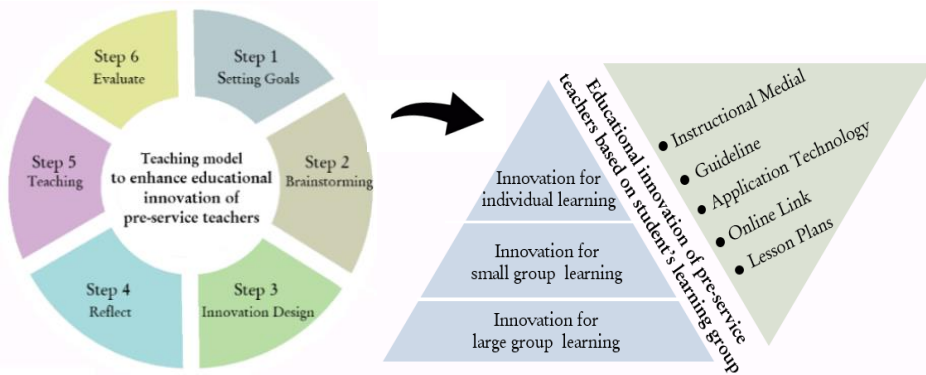


Figure 1.
Educational Innovation of Pre-service Teachers through Multi-educational Tools

Figure 1 figure out enhancement of educational innovation for pre-service teachers with 6 steps based on learning group: large group, small group, and individual learning. Multi-educational tools for gaining their innovative thinking showed in various kinds of applications. Instructional media, guideline, application technology, online link, and lesson plans were significantly tools. Instructional media were categorized in modeling, 3D pop-up, paper mache, slide card, Diagram, digital media and electronic book (Table 2). The different groups express their nature of learning to the various kind of innovations (Amaragoon et.al., 2018; McNeil & Borg, 2018). They are now adapting their behavior to learning strategies in which 21st century learning is a dynamic environments (Sampson et.al., 2018).

Table 2.
Components of Educational Innovation Based on Learning Group

Categories	Instructional Media	Guideline	Online Link	Application Technology	Lesson Plans
Large group	✓	✓	✓	✓	✓
Small group	✓	✓	✓	✓	✓
Individual learning	✓	✓	✓	✓	✓

Table 2 showed that modeling was highest type for innovation for large group learning, pop-up was highest type for innovation for small group learning, and digital media was highest type for innovation for individual learning. The educational innovation developed by pre-service teachers had 5 components: instructional media, guideline, online link, application technology and lesson plans that used for instructional media of pre-service teachers (Table 3).

Table 3.
Types for Instructional Media of Pre-service Teachers

Categories	Types of instructional media						
	Modeling	3D pop-up	Paper mache	Slide card	Diagram	Digital media	Electronic book
Large group	f = 13 (40.62%)	f = 3 (9.38%)	f = 4 (12.50%)	f = 2 (6.25%)	f = 6 (18.75%)	f = 3 (9.38%)	f = 1 (3.12%)
Small group	f = 4 (12.50%)	f = 10 (31.25%)	f = 3 (9.38%)	f = 9 (28.13%)	f = 2 (6.25%)	f = 2 (6.25%)	f = 2 (6.25%)
Individual learning	f = 1 (3.12%)	f = 6 (18.75%)	f = 1 (3.12%)	f = 7 (21.88%)	f = 4 (12.50%)	f = 8 (25.00%)	f = 5 (15.63%)

Table 3 showed that modeling suitable for large group learning, 3D pop-up suitable for small group learning, and digital media suitable for individual learning. In addition, the research also found types for instructional media there are modeling, 3D pop-up, paper mache, slide card, diagram, digital media and electronic book (Figure 2). Different group of learning reacts with types of instructional media (Mouw et.al., 2018). Even though new era of learning tend to be invite online learning or internet resources, the instructional media may be suitable to nature of learning and learning environments (Australia Government, 2009; Ennis et.al., 2018)

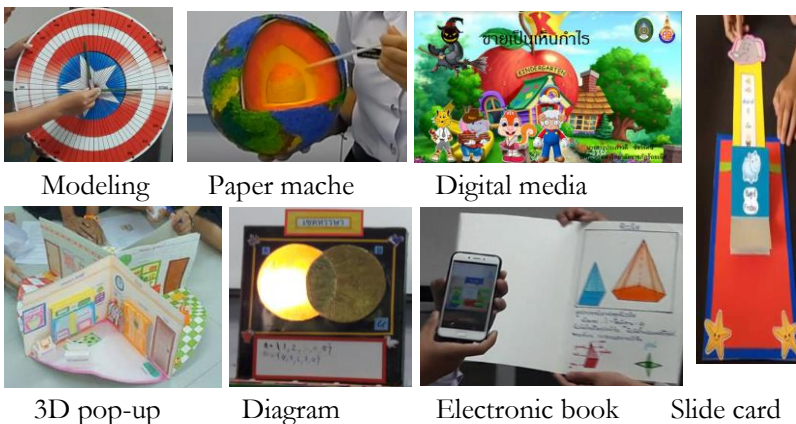


Figure 2.
Examples of Instructional Media

Types for instructional media showed that modeling suitable for innovation for large group learning that is because pre-service teachers can see it in clearly and easy to understand in the lesson. 3D pop-up suitable for small group learning because it is a medium-sized instruction media which they introduced 3D pop-up to design a rotary learning design and linking content to simply lesson. Digital media suitable for individual learning, it is designed by technology application. They were familiar with technology and can easily access and everyone who is digital media is of interest to students, can learn outside the field and have unlimited time of learning.

Conclusion

The instructional practices to enhance educational innovation of pre-service teachers consists five parts: (1) learning principles, (2) objectives, (3) teaching process, (4) social system, (5) response principle, and (6) support system. For teaching process consists of 6 steps: setting goals, brainstorming, innovation design, reflect, teaching, and evaluation. As a result, a teaching model can promote the educational innovation of pre-service teachers, it was found educational innovation based on learning group had 3 categories there are innovation for large group learning, innovation for small group learning and innovation for individual learning, and each educational innovation consists five components were instructional media, guideline, online link, application technology and lesson plans.

Students can express their imagination and creativity through play and learning (Aljarrah, 2017). The learning environment and educational tools should engage them to the lesson. The multi-educational innovations can help students as well as teaching competency to the innovative classroom (Thahir *et.al.*, 2019). Teachers and parents have to aware and recognize that multi-education tools assist students meet their real potential (Ateş, 2018). Also, it can use to scaffolding students to meet the requirements of curriculum and teacher preparation program. Young teachers can create their lesson and educational tools response to different learning styles.

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