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Research Article

Critical Competencies For Innovation Creating Of Pre-Service Teachers

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Abstract

This research is a survey for critical competencies for innovation creating of pre-service teachers. The sampling group are 65 third-year undergraduate students registered in the course of learning management design, Suan Sunandha Rajabhat University. The results show that most respondents are derived from male about 50.77% and female about 49.53%. Overall critical competencies for innovation creating are rated as high. When considering each aspect, all aspects are rated as high. The statistical values are different as: competency of utilization of existing materials and equipment, setting up plan of innovation creating, understandings of innovation creating stages, and future innovation forecasting, respectively.

Keywords: Innovation Creating, Competencies for Pre-service Teachers, Design Thinking

INTRODUCTION

Modern learning focuses on giving learners opportunities to be thinkers and research operators. Learners need to be developed to work and live with quality. Therefore, learners have to possess the skills of innovation creating and creative thinking as essential fundamentals (Office of Permanent Secretary, Ministry of Education,2016; Ministry of Education, 2016). Creative thinking is defined as capability to initiate to solve problem or develop new thing by using various thinking methods and have to be good listener who listens to problems and stories, as well as accepts capabilities leading to learning exchange. Present learning management should give learners the opportunity to learn without inhibiting thinking and imagination. Instructors only acts as behavior observer and empathizing them. Present learning management is management for sustainable development. In addition, globalization leads to dramatic change in the aspect of society, economics, politics, technology, sciences, and environment has currently become an important topic and to educate and implant environment awareness social media has

influenced in society and people (5) which causes interdependence and global connection. Consequently, various differences occur in the aspect of vision, values, beliefs, culture, social expectation, and education concept for sustainable development. As a result, education management should be congruent with environment change. The transformation of traditional learning activities that focuses on instructor-centered approach to flexible learning activities creates challenges, stimulates learners to think creatively, and leads to learning skill of 21st century such as analytical thinking, creative thinking, and problem solving which are the most significant thinking skills of present world because these help learners to be persons who create new knowledge by themselves (Khlaisang,Teo and Huang, 2021; Khlaisang and Songkram, 2019). Today it is the era of the digital economy, which innovation is the key to create an economic competitive advantage. Innovation is the creation of new elements or benefits which have value to be used in life and worked effectively. It includes developing and improving old products significantly (Kadar, Moise, & Colomba, 2014). And in the 21st century, teaching and learning is essential to develop learners to develop innovative skills. So leaners can create, develop and be successful in their careers in the future (Bellanca, 2010). It is imperative that those who work as teachers are required to develop innovative skills by starting from when they were pre-service teachers. And when they get a teacher's license, they have the ability to manage learning to develop learners to have innovative skills (Clark and French, 2014). As mentioned above, the researcher interests in exploring Critical Competencies for Innovation Creating of Pre-service Teachers in order to get basic information on learning management for pre-service teachers in the future.

Literature review

Innovative competency is the ability of individuals to recognize the opportunity for change, to be able to bring new ideas to develop innovation in the work environment for the most efficient with limited resources; and it also includes the ability of people to improve and apply between old ideas and new ideas perfectly. (vila, pérez, & coll-serrano, 2014) initiating new processes or innovations to use in the work and teaching management of teachers in order to transfer an appropriate knowledge, it will lead to efficient knowledge sharing and integrating among all stakeholders. İt will lead to create innovation effectively. (blumenberg, wagner, &beimborn, 2009). The meaning of innovative thinking that is human ability to imagine in the foresight of something then create or invent something or initiate new things better than before and try to find ways to bring new ideas to produce new product that is different from other people. And if it is developed and revised repeatedly, it will lead to innovation. And create new things for the benefit of the purpose according to the set goals (garrison, 2016; ekanem, 2016). However, the competence of innovators is not limited to knowledge from a single field of study, but it is necessary to apply a wide range of knowledge.

Design thinking is the essential technique and skill that leads to capability to understand problem solving and is also the concept for supporting designing and developing innovation. This helps building inspiration in solving problems, thinking, and creating new inventions and several technologies, causing changes in the way of life. It is the practice of thinking and finding various solutions to several problems until graduation. The method and principle of creating thinking process skill should be done as the fundamental of learning, which is corresponding to approaches

in learning of innovation creating. These consist of competencies in the aspect of existing materials and equipment, setting up plan of innovation creating for using in everyday life. Learners should understand innovation creating stages, and finally learners should have capability of future innovation forecasting and can communicate and work with others. The capability of innovation creating is creative thinking and bringing that creativity into practice. This contributes to developing concrete works or new products to respond wants by using suitable process and technology of inventing new products for future wants and congruent with modern technology (brown and wyatt, 2010) developed innovation may transform into capital in the form of intelligent property. In this research, researcher set competencies for innovation creating by relying on the process of design thinking because this can be adapted for solving problems, helping you face various challenges and can truly access the core of innovation creating, helping respond wants directly to the point. Design thinking is the concept focusing on solving problems and responding human needs by using human-centered or user-centered approach (royal civil service commission, 2017) which emphasize on understanding users in depth about their experience or service admission. These are derived from belief that persons who face problems will be persons who have suitable competencies in solving problems they are facing (plattner, 2010) design thinking is the concept focusing on understanding of beliefs, values, inspiration, behaviors, and individual challenge and encouraging people who have direct experience to participate in designing and giving a chance to get feedback from people involved, leading to innovation creating that is a guideline of solving various problems and meeting the wants of users. A popular and prevailing concept is the concept of d.school, stanford university which consists of 5 stages (henriksen, richardson, & mehta, 2017) as following:

1) empathize is the first stage of design thinking process which is defined as understanding problems by observing, participating, empathizing people around you in order to understand their experiences and motivations. Empathy is significant for design thinking process that focuses on human-centered approach.

2) define is the stage of bringing all information from the first stage together for analyzing and synthesizing. Then selecting only information that is truly related to problems and using it for explaining facing problems by focusing on human-centered approach.

3) ideate is the stage of making ideas to be concrete by team members might think outside the box to search for new problem-solving methods. Brainstorm might be used to stimulate members to think liberally and expand problem solving scope. Then gathering ideas and choose the good or suitable one.

4) prototype is the stage of creating innovation prototype by reducing size, function, or details in order to examine problem solving method and might forward innovation invented for testing, then bringing results to create problem solving guidelines or improve innovation to meet wants.

5) test is the final stage which is testing problem solving methods or innovation by emphasizing on understanding a target group as deeply as possible. As mention previously, design thinking is the process that provides learners an opportunity to create and develop ideas, processes, and skills.

Learners will obtain direct experience from understanding problem by observing. Learners can examine and collect information by linking, observing, and raising questions about a particular subject or situation. In addition, design thinking enables learners to develop capability of explaining concept from experience reasonably by surveying relationship of learned things. Learners can also expand knowledge further to support deeper understanding of concept. Furthermore, learners will receive feedback about the explanation of their own understanding which encourage learners to evaluate their own understanding as well.

Research Methodology

Research Instruments is an assessment form of critical competencies for innovation creating of pre-service teachers which is created by studying relevant document and research and adapting the concept of design thinking process-five stages of D.School, Stanford University (Henriksen, Richardson, & Mehta, 2017). The assessment form is created to cover the utilization of existing materials and equipment, setting up plan of innovation creating, understandings of innovation creating stages, and future innovation forecasting. The 15 questions used are made in rating scale format. Level 5 of rating scale is the highest, then high, moderate, low, and lowest, respectively. Assessment form of critical competencies for innovation creating of pre-service teachers which is created with examination of appropriateness and content validity from specialists. Appropriateness index is at 5 and content validity is at 0.94. Then, the assessment form that is revised and improved is brought to test for analyzing reliability by finding α-Coefficient of Cronbach which is at 9.47. This research explores for the critical competencies for innovation creating of pre-service teachers. The survey was done with population group of 2,365 undergraduate students, faculty of education, Suan Sunandha Rajabhat University, Bangkok, Semester 2, academic year 2020. The sampling group applied in this research, researcher selects purposive sampling who are 65 third-year students registered while learning management design of educational technology and computer. These students register to learn as normal education plan. Regarding variable scope, independent. Variables are learning management while learning management design of educational technology and computer whereas dependent variable is critical competencies for innovation creating. Statistical used for analyzing information from assessment form of critical competencies for innovation creating of pre-service teachers about basic information of respondent used are percentage, mean, and standard deviation.

research results

The results of analyzing assessment form of critical competencies for innovation creating of pre-service teachers, most of the respondents are male (50.77%) and the rest are female (49.23%) from total 65 respondents. And overall analysis results are as the following

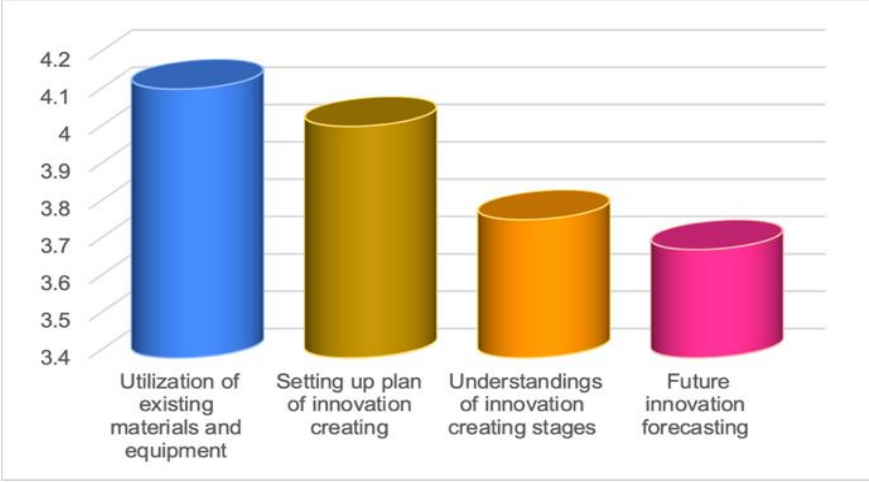

Figure 1: Figure1 The critical competencies for innovation creating of pre-service teachers

According to Figure1, overall critical competencies for innovation creating of pre-service teachers is rated at high level ($\overline{X}$ = 3.90, SD = 0.66). When considering each aspect, we find that all aspects are rated at high level and have different statistical values: The utilization of existing materials and equipment ($\overline{X}$ = 4.12, SD = 0.52), setting up plan of innovation creating ($\overline{X}$ = 4.02, SD = 0.72), understandings of innovation creating stages ($\overline{X}$ = 3.77, SD = 0.70), and future innovation forecasting ($\overline{X}$ = 4.12, SD = 0.52), respectively. The details of each aspect are presented as the following figure.

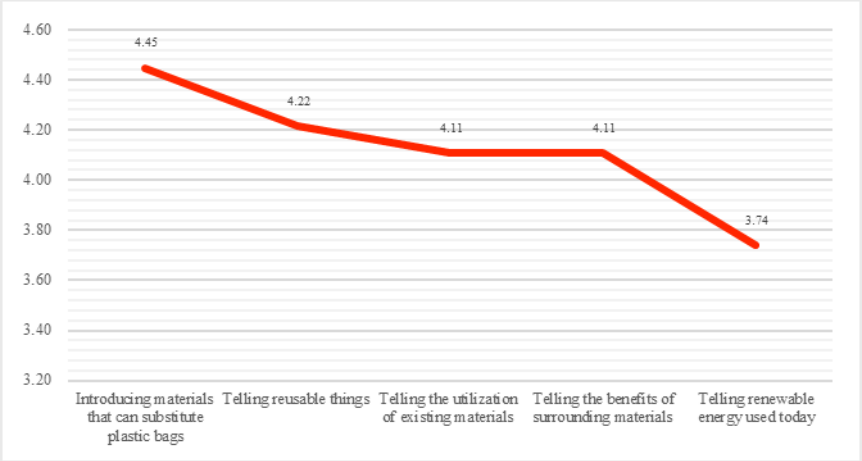

Figure 2: The critical competencies in the aspect of existing materials and equipment

According to figure2 overall critical competencies for innovation creating of pre-service teachers in the aspect of the utilization of existing materials and equipment is rated at high level. When considering each aspect, we find that 2 aspects are rated at highest level which are Introducing materials that can substitute plastic bags ($\overline{X}$ = 4.45, SD = 0.66) and telling things / equipment that can be reused (

$\overline{X}$ = 4.22, SD = 0.65). The aspects that are rated at high are adapting existing materials/ equipment to other works ($\overline{X}$ = 4.11, SD = 0.72), telling the benefits of surrounding materials/ equipment usage ($\overline{X}$ = 4.11, SD = 0.67), and Telling renewable energy used today ($\overline{X}$ = 3.74, SD = 0.79), respectively.

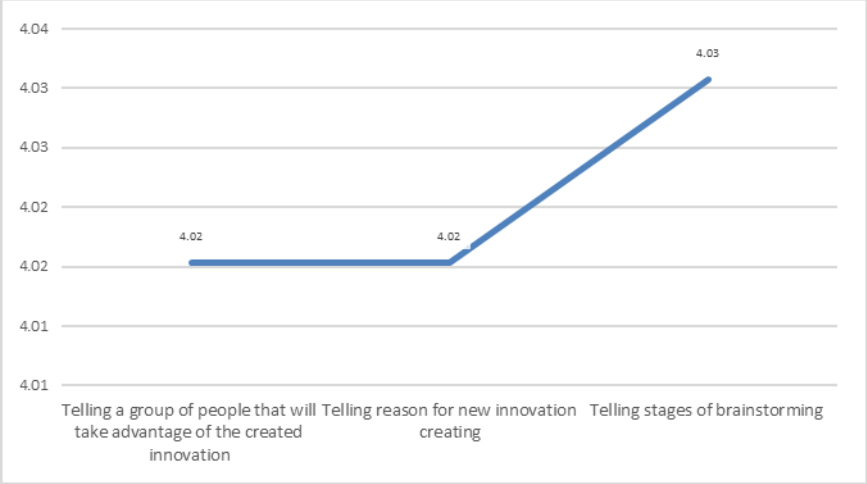

Figure 3: The critical competencies in the aspect of existing materials and equipment

According to figure3 overall critical competencies for innovation creating of pre-service teachers in the aspect of setting up plan of innovation creating is rated at high level. When considering each aspect, we find that all aspects are rated at high level: telling stages of brainstorming to get innovation creating methods ($\overline{X}$ = 4.03, SD = 0.86), telling reason or necessity for innovation creating ($\overline{X}$ = 4.02, SD = 0.82), telling a group of people that will take advantage of the created innovation ($\overline{X}$ = 4.02, SD = 0.82), respectively.

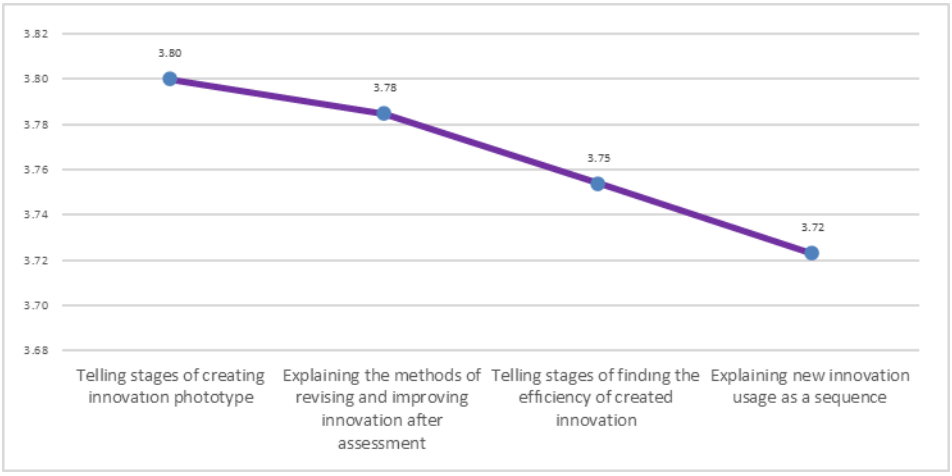

Figure 4: The critical competencies in the aspect of future innovation forecasting

According to figure4, overall critical competencies for innovation creating of pre-service teachers in the aspect of understandings of innovation creating stages is rated at high level. When considering each aspect, we find that all aspects are rated at high level: telling stages of creating innovation phototype ($\overline{X}$=3.80, SD = 0.75), explaining the methods of revising and improving innovation after assessment ($\overline{X}$=3.78, SD = 0.83), telling stages of finding the efficiency of created innovation ($\overline{X}$=3.75, SD = 0.90), explaining new innovation usage as a sequence ($\overline{X}$= 3.72, SD = 0.91), respectively.

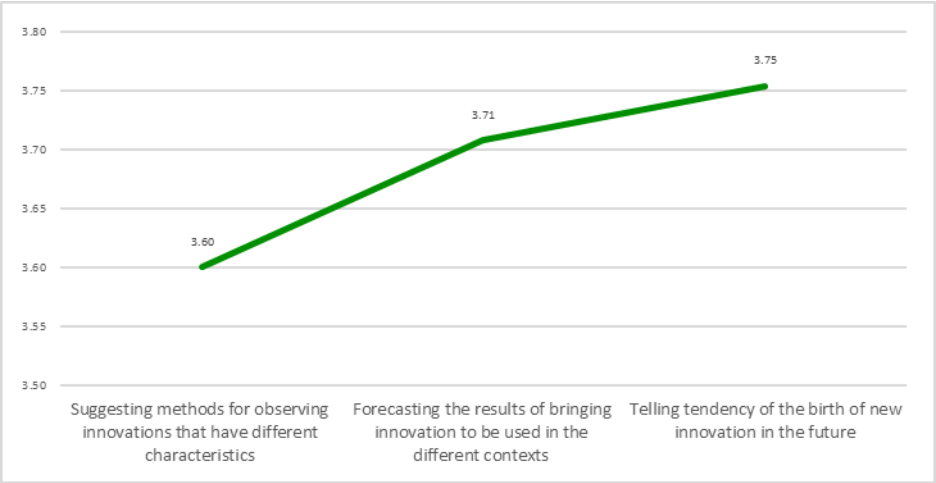

Figure 5: The critical competencies in the aspect of future innovation forecasting

According to figure5, overall critical competencies for novation creating of pre-service teachers in the aspect of future innovation forecasting is rated at high level. When considering each aspect, we find that all aspects are rated at high level: telling tendency of the birth of new innovation in the future ($\overline{X}$=3.75, SD = 0.79), forecasting the results of bringing innovation to be used in the different contexts ($\overline{X}$=3.71, SD = 0.81), and suggesting methods for observing innovations that have different characteristics ($\overline{X}$=3.60, SD = 0.83), respectively.

DISCUSSION AND CONCLUSION

Most of the respondents are male students (50.77%) and the rest are female students (49.23%). Overall critical competencies for innovation creating of pre-service teachers is rated at high level. When considering each aspect, we find that all aspects are rated at high level with different statistical values: competency of utilization of existing materials and equipment, setting up plan of innovation creating, understandings of innovation creating stages, and future innovation forecasting, respectively. When considering each aspect of utilization of existing materials and equipment, we find that two aspects are rated at highest level which are introducing materials that can substitute plastic bags and telling things / equipment that can be reused. the aspects that are rated at high are adapting existing materials/ equipment to other works, telling the benefits of surrounding materials/ equipment usage, and telling renewable energy used today, respectively. Regarding overall critical competencies for innovation creating in the

aspect of setting up plan of innovation creating is rated at high level. When considering each aspect, we find that all aspects are rated at high level: telling stages of brainstorming to get innovation creating methods, telling reason or necessity for innovation creating, and telling a group of people that will take advantage of the created innovation. Regarding overall critical competencies for innovation creating in the aspect of understandings of innovation creating stages is rated at high level. When considering each aspect, we find that all aspects are rated at high level telling stages of creating innovation phototype, explaining the methods of revising and improving innovation after assessment, telling stages of finding the efficiency of created innovation, and explaining innovation usage as a sequence. Concerning overall critical competencies for innovation creating in the aspect of future innovation forecasting is rated at high level. When considering each aspect, we find that all aspects are rated at high level: telling tendency of the birth of innovation in the future, forecasting the results of bringing innovation to be used in the different contexts, and suggesting methods for observing innovations that have different characteristics. Overall critical competencies for innovation creating of pre-service teachers is rated at high level. When considering each aspect, we find that critical competencies in the aspect of existing materials and equipment is rated at high level with higher mean than other aspects. We also find that two aspects are rated at highest level which are introducing materials that can substitute plastic bags and telling things/equipment that can be reused. This reflects an understanding of the value of surroundings which is the fundamental of new innovation creating for life in the future. Critical competencies in the aspect of setting up plan of innovation creating is rated at high level. When considering each aspect, we find that telling stages of brainstorming to get innovation creating methods has higher mean than other aspects which reflects that learner realizes the importance of brainstorming and listening to the opinions of others. This aspect is significant for new innovation creating that is accepted in society. Henriksen, Richardson, & Mehta (2017). explained that “Ideate” is the linkage of ideas between the defined problem frameworks and is the expression of ideas on various innovative problem-solving methods or solutions, leading to creating methods or solutions or new innovation for solving facing problems. In addition, Johns (Johns, 2017**)** mentioned that the idea reflection from learning exchange helps individuals to review their own practice, leading to self-learning and development. Studying critical competencies for innovation creating of pre-service teachers indicates that the competency level of future innovation forecasting and telling tendency of the birth of new innovation in the future have rather low mean. Therefore, learners should be developed more about studying, researching, and following international innovation development methods. In addition, learning management that can foster innovation skills for students in higher education should be taught through experiential, collaborative, and projected-based learning. It should encourage students to develop advanced thinking skills that can be further developed into innovative thinking through learning experiences (Hart, 2013), which promotes important skills of learners to encourage them to design learning for them to learn from real experiences and use information technology. (Miri Barak and Shiran Yuan, 2021; Mugione and Penaluna, 2018; Garrison, 2015).

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ETHICAL DECLARATIONS

No ethical issues were found. Participants have attended in this study willingly and data was presented anonymously. Participants were assured that their information will remain confidential. This study was approved by the faculty of education, Suan Sunandha Rajabhat University, Thailand.

AUTHORS' CONTRIBUTIONS

Study concept, design, and critical revision of the manuscript for important intellectual content was developed by the author who participated in all the research process stages.

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CONFLICT OF INTERESTS

The author declares no conflict of interests.

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