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The Study of the Needs of Developing Design Thinking to Promote Learning Activities in Teaching Physical Education and Health Education for Pre-Service Teachers

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Abstract

Design thinking is an important and necessary process to develop pre-service teachers, especially majoring in physical education and health education. It assists them in improving their learning design, creating innovations that promote knowledge and designing services that enhance innovation in physical education and health education in the community. Therefore, the objectives of this study are to investigate the needs of developing design thinking that boosts the organization of learning activities in physical education and health education of 364 pre-service teachers at Faculty of Education of 11 northeastern Rajabhat Universities, Thailand. The research tools consist of a questionnaire of the necessity of design thinking, including five levels of options indicating current conditions and five levels of expected needs. In addition, statistics used for the data analysis is mean, standard deviation and the index value of the importance of the needs. The results of the study showed that in Aspect 1 (Empathize), the overall needs index is at the level of 0.80, the current condition at (M = 2.30, S.D. = 0.90), and the expected needs at (M = 2.30, S.D. = 0.90). For the Aspect 2 (Define), the overall needs index is at the level of 0.72, the current condition at (M =2.41, S.D.= 0.93) and the expected needs at (M =4.15, S.D.=0.77). In addition, for the Aspect 3 (Ideate), the overall needs level is at 0.66, the current condition at (M = 2.50, S.D.=0.93) and the expected needs at (M = 4.14, S.D.=0.77). Moreover, in the Aspect 4 (Prototype), the overall needs index is at 0.66, the current condition at (M =2.49, S.D.=0.94) and the expected need at (M =4.13, S.D.=0.79). Finally, in the Aspect 5 (Test), the overall needs index is at 0.61, current condition at (M =2.56, S.D.=0.94) and expected needs at (M =4.13, S.D.=0.80).

Keywords: Design thinking, Pre-service teachers of Physical Education and Health Education, needs

1 Introduction

OECD: Organization for European Economic Co-operation has studied the direction of education and skill development that are crucial for today and the future world in 2030. It is found that key skills that are developed by the learners and the teachers are that teachers can design and create knowledge by themselves and provide real experience for students. Also, teachers can encourage students to develop teamwork and brainstorming, create and design innovation and technology, promote creative problem-solving ideas and equip systems thinking skills [1]. As a result, education management in Thailand must focus on human resource development in order to possess the ability to compete on an international level [2]. The learning process reform plan for education in the 21st century shows the importance of adjusting the learning system, transforming the teacher production system and creating a new generation of teachers who can manage education effectively in every level and type. Moreover, the new generation of teachers are lifelong learners and can develop lifelong learning for students [3],[4]. Design thinking is a thinking process to solve problems that arise in various environments according to the needs of the target group [5]. It can be useful in education, invention, design and prototyping and experimentation to solve problems and to meet the needs that are consistent with a specific design direction for each

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problem [6]. In developing education, the OEDC states that if students have an understanding of design thinking, it will lead pre-service teachers to be able to design teaching, innovation and services based on the differences of learners, which are consistent with the community context [7], [8]. In addition, [9] studied the design thinking process to be utilized to solve students' problems. It was found to be a solution that meets the needs of those struggling and supports appropriate learning, and in the near future, design thinking is expected to be used as an innovative approach in organizations. Moreover, it has also become an important part of education management, especially in designing and developing innovations [10]. Physical education and education are related to design thinking. Although it is successful in using design thinking to enhance learning design in many subjects, there are still challenges in instructional design in physical education and health education [11]. In developing design thinking for physical education and health education, educators have suggested learning management design using design thinking that consists of five processes: 1) Compassion 2) Ideate 3) Prototype 4) Implement and 5) Evaluate that can help broaden the teaching of physical education and health education to learners with different interests and physical conditions [12]. Organizing learning activities by using design thinking can help design curriculum, teaching methods and assessments that encourage student to learn and develop various skills [13]. Also, the innovations in physical education can help solve student and social problems, increase the value and development of learners' learning to be more effective. [14], [15], [16]. Following the past situation of teaching practice in educational institutions of pre-service teachers, they are assigned and expected to design learning activities and create innovation that supports learning management and design health services for both schools and communities. Therefore, this is the reason for studying the needs for developing design thinking of physical education and health education students at Faculty of Education, of 11 Rajabhat Universities in the northeastern region, to be used as basic information for designing and developing learning activities and inventing innovation for the development of teacher professional students in the field of physical education and health education to possess design thinking skills and be able to apply design thinking skills to create innovations that help solve problems and meet the needs of students. Also, design thinking supports creative design of learning activities through practice of teacher students, especially those major in physical education and health education to become effective educational personnel in the future.

Literature review

Design Thinking

Design thinking was originated in architectural design for more than 30 years [5]. After that it has been used in education, and later "Design Thinking" was defined by scholars. [8], [15], [17] [18], [19] described that design thinking is science with the human being at the center of the innovative design based on problem solving appropriate to the user's context. The Hasso Plattner Institute of Design (d.School)'s design concept consists of a five-step design process [20], [21], [22].

Table 1: Design Thinking Processes

The 5 Phases of Design Thinking	Design thinking processes
1. Empathize	Empathizing and observing It is suggested to study the target audience as much as possible to realize the problems by means of observing, questioning, surveying, photographing, recording and living in real situations to understand problems and needs without blocking ideas and creating challenges to the problems encountered.
2. Define	Defining the problem After understanding the real problems, it is important to have data synthesis and open-ended questions that support the impetus for solving the

The 5 Phases of Design Thinking	Design thinking processes
	problems without limiting the problem-solving framework.
3. Ideate	Creating ideas This step focuses on brainstorming new ideas without the limitation of ideas or the requirement of framework, but emphasizing on solving the arising problems.
4. Prototype	Prototyping This step is to summarize information from the concept, create innovations that solve problems, test and utilize the results to fix, improve and use the innovations to trial with larger groups.
5. Test	Testing This step emphasizing on utilizing tested innovations with target groups by collecting information on various aspects and use it to improve the innovations to meet the needs of the users.

Design thinking, therefore, is a process for developing pre-service teachers to become innovators in order to train them to understand students' problems and find the perception of the target group towards the created learning innovative model. Also, those innovative prototypes created will be utilized and applied to the target audience to earn advice. After that the problems or limitations found will be improved [19], [23].

The teaching of physical education and health education

Teaching health and physical education mainly focuses on the holistic development of learners. It consists of teaching health education which is a combination of learning experiences planned using evidence-based practice and/or rational theories that provide an opportunity to acquire knowledge, attitudes and skills needed to implement and maintain healthy behaviors [24]. In addition, teaching physical education comprises of the development of elements including physical, social and emotional issues and other skills that focus on reducing health risk behaviors and promote good decision-making. The teaching and learning of health and physical education is based on providing an equitable education for all learners to access a balanced and comprehensive curriculum in health aiming at maintaining good health, health promotion and sustainable development of the quality of life of individuals, families and communities [25], [26]. For educational management in the learning of health education and physical education, learning standards cover the development of learners in five areas [25], including 1. Human Growth and Development 2. Life and Family 3. Movement, Physical Exercise, Games, Thai and International Sports 4. Health-Strengthening Capacity and Disease Prevention and 5. Safety in Life. Moreover, all these elements must be properly integrated among learners in all years and across all areas [27]. Changing physical education and health education learning styles must take into account the design of learning activities that allow teacher-student interaction, and teachers must adapt their teaching strategies to meet the needs of each learner [28]. It is crucial to train pre-service teachers to prioritize their attention to their problems, practice working with pre-service teachers from other professional fields and conduct innovative design and trial evaluate solutions to problems through repetitive practice in the course [29], [30].

2 Research Methodology

Population and Sampling

The population used in this research were fifth-year students at Faculty of Education from 11 northeastern Rajabhat Universities, Thailand in academic year 2023. The total population

is 4,050 students.

The sample group in this research is 364 fifth-year students at 11 Rajabhat Universities (Northeastern group), Thailand. The formula to calculate the sample group is Taro Yamane [31], which is appropriate to the size of the population in this study. It is considered to have a standard error at not more than 5% or at the statistical significance level of 0.05.

Research Instrument

A questionnaire was utilized in this study to examine the needs for pre-service teachers to acquire design thinking skills that support learning activities in physical education and health education. A 5-level estimating scale (dual-response format) defines it. It covered 5 stages including; 1) Empathize 2) Define 3) Ideate 4) Prototype and 5) Test. The following procedures were used to determine whether the 21 questions had passed the validity and reliability tests for the research instrument.

2.1 The questionnaire was distributed to three experts. They were all either lecturers in physical education and health education at the higher education level or held doctoral degrees in the fields of physical education and health education. The experts' areas of expertise included activity design and teaching, physical education, and health education. They considered the consistency of elements and questions to check content validity. The results were analyzed for the Item-Objective Congruence Index (IOC) by assigning an acceptable conformity index value of 0.5 or higher [32]. The IOC value for all 21 items in the Content Straightness Quality Check results was 0.95.

2.2 The researcher tested the questionnaire by gathering actual information from pre-service teachers who shared the same characteristics as the samples utilized in this study. Cronbach's Alpha Coefficient was used to assess the data's reliability. The total precision value was 0.95, exceeding the acceptable precision criterion of 0.70 [33].

It was required that the subjects had to fill out in the questionnaire by themselves (Self-Administered Questionnaire) and it is divided into two parts as follows:

Part 1 is a questionnaire about general background information of the survey respondents who are required to select the item that is closest to them.

Part 2 is a questionnaire about the opinions of the survey respondents in terms of the demand and the understanding and needs for the development of design thinking, which is divided into two parts:

Part 2.1 is the comprehension level of respondents to develop design thinking that is currently effective for pre-service teachers in Physical Education and Health Education.

Part 2.2 is the expected needs levels to develop design thinking for pre-service teachers in Physical Education and Health Education.

Data Collection

The researcher contacted 11 northeastern Rajabhat Universities for permission to collect data from the fourth year and fifth year students at Faculty of Education, Department of Physical Education. The researcher delivered a questionnaire through Google forms to the sample group and explained the directions to answer the questionnaires. In addition, the researcher clarified the use of information, methods and procedures. Also, the research results were sent to respondents via Google forms. After receiving the information, the data will be analyzed.

Data Analysis

The analysis of data is quantitative analysis of mean, standard deviation and the

priority of Needs Index modified (PNI modified) [34],[35].

Research results

Table 2 Mean, Standard Deviation of the current condition and the expected level condition of the pre-service teachers at Department of Physical Education and Health Education in Aspect 1 (Empathize) and to prioritize the needs with the $PNI_{modified}$ index.

Assessment Items	Current condition			Expected needs			Needs	Priority
Aspect 1 (Empathize)	**Mean**	**SD**	**Analysis**	**Mean**	**SD**	**Analysis**	**$PNI_{modified}$**	
- The ability to observe the behaviors of ordinary people	2.21	1.00	low	4.13	0.80	high	0.87	2
- The ability to correctly and appropriately ask questions related to the problem	2.19	0.94	low	4.13	0.80	high	0.89	1
- The ability to completely write down information related to the problem.	2.32	0.92	low	4.13	0.80	high	0.78	3
- The ability to save images that can be used in connection with the problem	2.34	0.92	low	4.15	0.79	high	0.77	4
- The ability to interview individuals to realize deeply about the problem and the appropriate interview method	2.44	0.75	low	4.18	0.93	high	0.71	5
Overall average	**2.30**	**0.90**	**low**	**4.14**	**0.82**	**high**	**0.80**	

Table 2 indicates the results of the needs in Aspect 1 (Empathize) when considering and prioritizing the needs to show the importance of the actual problem with the $PNI_{modified}$ index. It was found that the ability to ask questions related to the problem correctly and appropriately had the $PNI_{modified}$ index value at 0.89, current condition at (M = 2.19, S.D= 0.91), the level of expected needs at (M=4.13, S.D= 0.80), which is considered as the highest. In addition, when considering each item, it was found that the $PNI_{modified}$ index was between 0.71 - 0.89. The first three needs included the ability to correctly and appropriately ask questions related to the problem at (0.89), current condition at (M = 2.19, S.D = 0.91), expected level of needs at (M = 4.13, S.D = 0.80); the ability to observe the behaviors of ordinary people at (0.87), current condition at (M = 2.21, S.D = 1.00), and expected level of needs at (M=4.13, S.D= 0.80); and the ability to save images that can be used in connection with the problem at (0.89), current condition at (M=2.19, S.D= 0.94) and expected levels of needs at (M=4.13, S.D= 0.71), respectively. All three items are considered highest needs.

Table 3 Mean, Standard Deviation of the current condition and the expected level condition of the pre-service teachers at Department of Physical Education and Health Education in Aspect 2 (Define) and to prioritize the needs with the $PNI_{modified}$ index.

Assessment Items	Current condition			Expected needs			Needs	Priority
Aspect 2 (Define)	**Mean**	**SD**	**Analysis**	**Mean**	**SD**	**Analysis**	**$PNI_{modified}$**	
- The ability to listen about the study of problem conditions	2.42	0.98	low	4.21	0.70	high	0.74	2
- The ability to identify the	2.46	0.9	low	4.14	0.80	high	0.68	4

Assessment Items	Current condition			Expected needs			Needs	Priority
Aspect 2 (Define)	**Mean**	**SD**	**Analysis**	**Mean**	**SD**	**Analysis**	**$PNI_{modified}$**	
needs of the target audience								
- The ability to study, research, collect information and related ideas about the problem	2.44	0.93	low	4.15	0.80	high	0.70	3
- The ability to change from problems that arise into create a challenge that leads to problem solving	2.32	0.92	low	4.12	0.79	high	0.78	1
Overall average	2.41	0.93	low	4.15	0.77	high	0.72	

Table 3 showed the study of the needs in Aspect 2, the determination of solutions when considering and prioritizing the needs in order to demonstrate the importance of the existing problem with the $PNI_{modified}$ index. It was found that the ability to change from problems that arise into create a challenge that leads to problem solving had the $PNI_{modified}$ index value equal to 0.78, current condition at (M=2.32, S.D= 0.92), expected level of needs at (M=4.12, S.D= 0.79), which is considered the highest. In addition, when considering each item, it was found that the $PNI_{modified}$ index was between 0.78 - 0.68. The first three highest needs are the ability to change from problems that arise into create a challenge that leads to problem solving is at 0.78, current c ondition at (M=2.32, S.D=0.92) and expected level of needs at (M=4.12, S.D=0.79); the ability to listen about the study of problem conditions at (0.74), current condition at (M=2.42, S.D= 0.98) and expected level of needs at (M=4.21, S.D= 0.70); and the ability to study, research, collect information and related ideas about the problem is at (0.70), current conditions at (M=2.44, S.D= 0.93), expected level of needs at (M=4.15, S.D= 0.80), respectively, and all three of these are considered the highest.

Table 4 Mean, Standard Deviation of the current condition and the expected level condition of the pre-service teachers at Department of Physical Education and Health Education in Aspect 3 (Ideate) and to prioritize the needs with the $PNI_{modified}$ index.

Assessment Items	Current condition			Expected needs			Needs	Priority
Aspect 3 (Ideate)	**Mean**	**SD**	**Analysis**	**Mean**	**SD**	**Analysis**	**$PNI_{modified}$**	
- The ability to record and evaluate data from multiple perspectives	2.51	0.98	low	4.13	0.70	high	0.65	3
- The ability to evaluate information from different and diverse perspectives without previous studies or prepared information	2.46	0.90	low	4.15	0.80	high	0.69	1
- The ability to create new perspectives and a variety of methods that will lead to a way of thinking about solving problems	2.55	0.88	low	4.11	0.80	high	0.61	2
- The ability to summarize ideas from different perspectives and a variety of answers leading to the design of works to convey ideas into concrete	2.48	0.92	low	4.17	0.79	high	0.68	4
Overall average	2.50	0.93	low	4.14	0.77	high	0.66	

Table 4 indicated the study of the needs in Aspect 3 (Ideate) when considering and prioritizing needs to show the importance of the actual problem with the $PNI_{modified}$ index. It was found that the ability to evaluate information from different and diverse perspectives without previous studies or prepared information had the $PNI_{modified}$ index at 0.69, current condition at (M= 2.46, S.D.= 0.90), expected level of need at (M= 4.15, S.D= 0.80), which was considered the highest. In addition, when considering each item, it was found that the the $PNI_{modified}$ index was between 0.16 - 0.31. The first three highest needs is the ability to evaluate information from different and diverse perspectives without previous studies or prepared information is at 0.69, current condition at (M = 2.46, S.D. = 0.90), expected level of needs at (M = 4.15, S.D. = 0.80); the ability to create new perspectives and a variety of methods that will lead to a way of thinking about solving problems is at (0.61), current condition at (M= 2.55, S.D.= 0.88) and expected level of needs at (M= 4.11, S.D.= 0.80); and the ability to record and evaluate data from multiple perspectives is at (0.65), current condition at (M= 2.51, S.D= 0.98) and expected levels of needs at (M= 4.13, S.D= 0.70), respectively, and all three items are considered highest needs.

Table 5 Mean, Standard Deviation of the current condition and the expected level condition of the pre-service teachers at Department of Physical Education and Health Education in Aspect 4 (Prototype) and to prioritize the needs with the $PNI_{modified}$ index.

Assessment Items	Current condition			Expected needs			Needs	Priority
Aspect 4 (Prototype)	**Mean**	**SD**	**Analysis**	**Mean**	**SD**	**Analysis**	**$PNI_{modified}$**	
- The ability to communicate your own ideas about what you want to design	2.54	0.98	low	4.12	0.80	high	0.62	4
- The ability to analyze new data received and apply data to develop and improve concepts or prior knowledge	2.49	0.9	low	4.15	0.79	high	0.67	2
- The ability to develop design thinking to relate with the problem and close to reality	2.42	0.93	low	4.13	0.80	high	0.71	1
- The ability to gather information from a wide range of opinions to develop into concrete information	2.52	0.93	low	4.12	0.80	high	0.63	3
Overall average	2.49	0.94	low	4.13	0.7975	high	0.66	

Table 5 revealed the study of the needs in Aspect 4 (prototype) when considering and prioritizing needs to display the importance of the actual problem with the $PNI_{modified}$ index. It was found that the ability to analyze new data received and apply data to develop and improve concepts or prior knowledge had the $PNI_{modified}$ index equal to 0.71, current condition at (M = 2.42, S.D = 0.93) and expected level of needs at (M = 4.13, S.D = 0.80), which is considered the highest. When considering each item, it was found that the $PNI_{modified}$ index had a value between 0.71 - 0.62. The first three highest needs is the ability to develop design thinking to relate with the problem and close to reality had the $PNI_{modified}$ index equal to 0.71, current condition at (M= 2.42, S.D= 0.93) and expected level of needs at (M= 4.13, S.D= 0.80); the ability to analyze new data received and apply data to develop and improve concepts or prior knowledge is at (0.67), current condition at (M= 2.49, S.D= 0.90) and expected level of needs at (M= 4.15, S.D= 0.79); and the ability to gather information from a wide range of opinions to develop into concrete information is at (0.63), current condition at (M= 2.52, S.D.= 0.93), expected level of needs at (M= 4.12, S.D.= 0.80), respectively,

and all three items are considered highest needs.

Table 6 Mean, Standard Deviation of the current condition and the expected level condition of the pre-service teachers at Department of Physical Education and Health Education in Aspect 5 (Test) and to prioritize the needs with the $PNI_{modified}$ index.

Assessment Items	Current condition			Expected needs			Needs	Priority
Aspect 5 (Test)	**Mean**	**SD**	**Analysis**	**Mean**	**SD**	**Analysis**	**$PNI_{modified}$**	
- the ability to test what has been designed and use the results to improve and match the problem	2.55	0.99	low	4.13	0.79	high	0.62	2
- the ability to communicate ideas, processes, solutions to meet user's needs and expectations	2.53	0.92	low	4.15	0.80	high	0.64	1
- the ability to study user's opinions, and evaluate the results to improve and direct to problem solving in accordance with the needs of users	2.55	0.93	low	4.12	0.80	high	0.62	3
- the ability to communicate about the results of instructional design, product design or service design efficiently	2.62	0.92	low	4.1	0.81	high	0.56	4
Overall average	2.56	0.94	low	4.13	0.80	high	0.61	

Table 6 indicated the study of the needs in Aspect 5 (test) when considering and prioritizing needs to show the importance of the actual problem with the $PNI_{modified}$ index. It was found that the ability to communicate ideas, processes, solutions to meet user's needs and expectations had a the $PNI_{modified}$ index value of 0.64, current condition at (M = 2.53, S.D= 0.92) and expected level of needs at (M= 4.15, S.D= 0.80), which is considered the highest. When considering each item, it was found that the $PNI_{modified}$ index was between 0.64 - 0.56. The first three highest needs included the ability to communicate ideas, processes, solutions to meet user's needs and expectations had the $PNI_{modified}$ index value of 0.64, current condition at (M = 2.53, S.D. = 0.92) and expected needs level at (M = 4.15, S.D. = 0.80); the ability to test what has been designed and use the results to improve to match the problem was at (0.62), current condition at (M= 2.55, S.D= 0.99) and the expected level of needs at (M= 4.13, S.D= 0.79); and the ability to study user's opinions, and evaluate the results to improve and direct to problem solving in accordance with the needs of users was at (0.62), current condition at (M = 2.55, S.D. = 0.93) and the level of expected needs at (M = 4.12, S.D. = 0.80), respectively, and all three of these items are considered highest needs.

From the study of needs of developing design thinking to promote learning activities in teaching physical education and health education for pre-service teachers in 11 Northeastern Rajabhat Universities. It was discovered that there has been little research done on the need for developing design thinking skills, requiring the study of data from related stages. As a result, this study is the first to look into the necessity of teaching design thinking to physical and health education pre-service teachers in order to directly devlope instruction, innovative design, and learning activities.

Conclusion and Discussion

Following the study on the needs of design thinking for the instructional design, product design and service design that promotes the teaching of physical education and health education by using the design thinking process for pre-service teachers at Department of Physical Education and Health Education of 11 Northeastern Rajabhat Universities, Thailand. It was found that the highest

needs as follows: Aspect 1 (Empathize) has the average need value equal to the $PNI_{modified}$ index (0.80). The highest need is the ability to correctly and appropriately ask questions related to the problem with the $PNI_{modified}$ index value at (0.89). For Aspect 2 (Define), the value is equal to the $PNI_{modified}$ index at (0.72). The highest need is the ability to change from problems that arise into create a challenge that leads to problem solving with the $PNI_{modified}$ index value at (0.78). In Aspect 3 (Ideate), the average need value equals to the $PNI_{modified}$ index (0.66), and the highest need is the ability to evaluate information from different and diverse perspectives without previous studies or prepared information with the the $PNI_{modified}$ index at (0.69. In addition, in Aspect 4 (Prototype) is equal to the $PNI_{modified}$ index (0.66). The highest need is the ability to analyze new data received and apply data to develop and improve concepts or prior knowledge, with the $PNI_{modified}$ index (0.71). Finally, in Aspect 5 (Test), the average need is equal to the $PNI_{modified}$ index (0.61) and the highest need is the ability to communicate ideas, processes, solutions to meet user's needs and expectations, with the $PNI_{modified}$ index at (0.64). However, since the assessment of the necessary needs is between the current condition and expected condition, If the two parts are very different, then the needs will be considered high. Although design thinking is taught in the course, when the pre-service teachers have practiced the teaching profession, they find that they are unable to apply design thinking in all processes, with the following steps: 1) Empathize (understand the user), 2) Define (summarize the user's problem, 3) Ideate (create, combine ideas and screen to find suitable ideas) 4) Prototype (create models that relates to the problem of the user 5) Test (evaluate to obtain information from users, including students, teachers, and parents and then improve the results to create innovations that best suit the context which is consistent with [36] who studied the problems and needs of teaching innovations of teacher training students. It was found that they had problems and needs for innovative ideas in teaching and the use of innovative teaching methods and teaching strategies. have the highest level of needs. In addition, [37] studied on introducing design thinking as a guide for curriculum and the methods of teaching for students of physical education teachers. It was found that design thinking helped pre-service teachers create teaching methods that were suitable for their students. Moreover, [38] applied design thinking to design learning tasks that are appropriate for students and encourage them to participate in the creative process to solve problems. Following the traditional teaching of Physical Education and Health Education where the teacher is still the center of learning with the fixed pattern apparently cannot create learners with 21st century learning skills [39],[40]. Integrating design thinking to develop learning management innovations to increase the efficiency of physical education teaching will help pre-service teachers strengthen themselves to be knowledgeable, up-to-date and innovative to be able to apply digital technology to gain benefit for the learners. Also, it supports the development of various abilities, cultivate creativity and difference, make students entrepreneurs with an international perspective and competency in accordance with the desirable graduate characteristics of the teaching profession [41],[42].

Suggestion

General Suggestion

The results of the study of needs and guidelines for building competencies can be used as basic information to define and set guidelines for developing pre-service teachers to possess design thinking utilized in teaching and learning design, service design and innovative design that promotes the teaching of physical education and health education and becomes graduates whose characteristics meet the needs of quality graduate.

Suggestion for Further Study

1. There should be a study of processes, methods, development models to enhance competency in instructional design, service design and innovative design that promote the teaching of physical education and health education for pre-service teachers from Department of Physical Education and Health Education in other ways to increase efficiency.

2. There should be research to develop the competency of teaching professional students from Department of Physical Education and Health Education in terms of instructional design, service

design and innovative design to improve the teaching of physical education and health education by comparing the competencies in different aspects of the context, community, society and economy that are different.

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