THE STEM LEARNING EXPERIENCE IN EARLY CHILDHOOD EDUCATION OF PRE-SERVICE TEACHER.

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ABSTRACT

This research on the STEM learning experience in early childhood education of pre-service teacher focusing on the mixed method research which is aimed to study the status and problems of organizing the STEM learning experience in early childhood education of pre-service teachers and to study the ability of pre-service teacher in organizing a STEM learning experience in early childhood education**.** The sample group used in this research is the 5th year pre-service teacher majoring in early childhood education, who teaching at Kindergarten in the academic year 2018 (N=50) through cluster random sampling. The tools used in the research were questionnaires of the STEM learning experience in early childhood education of pre-service teachers and the questionnaires of the ability in organizing the STEM learning experience in early childhood education of pre-service teachers with values corresponding to the purpose and appropriateness of the content, with the index of congruence **(**IOC**)** valued between 0**.**80-1**.**00**.** The data was collected in year 2018 by using SPSS program to analyze the data. The statistics used in this data analysis are mean and standard deviation**.** The results of the research were as follows**:**1**)** The status and problem of STEM learning experience in early childhood education of pre-service teacher were at good level ($\overline{x}$ = 3.53, S.D.=0.85). 2**)** The pre-service teachers**'** ability to manage and organizing the STEM learning experiences in early childhood education were also at good level ($\overline{x}$ =3.94, S.D.= 0.68).

Key words: STEM Learning Experience, Pre-service Teacher, Early Childhood Education

INTRODUCTION

According to the curriculum of early childhood education in 2017, the goal of early childhood education development is to developed all aspects according to their age especially with the skills needed in the last 21st century 21 [1] which is in accordance with the National Education Plan [2] [3]with sustainable development goals to ensure that all boys and girls have access to care development and pre-education management for the quality early childhood education, therefore, those children will be ready for primary education. In consequence of learning management, the education at an early age stage is important and necessary, whereas the appropriate learning management model is to promote learning by doing. Children must learn through playing or through activities and such activities should promote children's thinking process to solve problems or find answers by themselves and to promote a balanced development of children accordingly. To organize the STEM learning experience in early childhood education, is another form of educational management that can develop children characteristics and skills that required in the last 21st century, in which considered as a holistic early childhood development program and considered as an integrating science with an early childhood education curriculum, moreover, integrating with the daily lives of children**.** In other words, the STEM education learning approach is emphasizing on problem solving, information and data exploration as well as project-based learning. The STEM education**'**s characteristic **(**Institute for the Promotion of Teaching

Science and Technology **[**4**]** consists of science, that is the education in which the content and matter of studies are an understanding the nature around them, focusing on developing an observational skills, experimental skills, predictions skills, hypotheses setting skills, explorations, discovery and queries skills etc. Technology, is the education in which is the matter of skills to use various tools and various technology to create and invent things. Engineering, is the education on an ability to plan and solve problem by using various devices available such as by using residue material to adapt or create new work, to create innovation or new design under various circumstances. Mathematics, is an education that promote the weighing skills, measuring skills, numbering skills, shaping skills, probability geometry, algebra, data analysis skills and mathematical process skills which is suitable for early childhood stage.

This can be stated that, the STEM education is a form of learning that enable and create experiences as to be basis of life skills for early childhood in Thai society that has been changed to Thailand 4.0 era which is aiming on stability, prosperity and sustainability [5]. The faculty of education plays an important role in producing quality teachers who should have knowledge and ability in managing learning effectively, especially managing the STEM education in early childhood education through various forms of learning process including teaching through course syllabus, through project work and through training [6]. When pre-service teachers conducted their teaching in the professional teacher development school at the early childhood level, they might have an opportunity to implement an integrated science in STEM education management in accordance with an early childhood education and curriculum.

Therefore, the researcher was interested in studying organizing the STEM learning experience in early childhood education of pre-service teachers and aimed to study the status and problems of organizing the STEM learning experience in early childhood education of pre-service teachers as well as to study the ability of pre-service teachers in organizing a STEM learning experience in early childhood education to be used as a guideline in developing STEM educational model in the early childhood educational level accordingly**.**

OBJECTIVES

1. To study the status and problems in organizing the STEM learning experience in early childhoodeducation of pre-service teachers**.**
2. To study the ability of pre-service teacher in organizing the STEM learning experience in early childhood education.
3.

METHODOLOGY

The research in organizing the STEM learning experience in early childhood education of pre-service teachers is a mixed method research

A. Scope of Population: the sample group used in this research is the 5^{th} year of pre-service teachers, studying in early childhood education in professional teacher development school in academic year 2018, with the total number of 50 respondents who passes the STEM education training in the early childhood educational level and has passed the early childhood camp project, this sampling group was derived from cluster random sampling.

B. Scope of Content:

1. STEM education in early childhood means learning management that integrate all 4 areas of education which include Science, Technology, Engineering and Mathematics

together in the form of integrative science in order to enable student's ability to apply their knowledge and increase their skills in solving problems.

2. Status and problems of organizing the STEM learning experience in early childhood means the practicing status and problems status that are affecting the STEM learning experience in early childhood education of pre-service teachers, such as, school management policy aspect, mentor aspect, parent's participation community and society participation aspect and pre-service teacher learning management aspect.

3. The ability to organize the STEM learning experience in early childhood means the ability to design and prepare teaching in organizing the STEM learning experience in early childhood education, in media, in learning resources also in measurement and evaluation in organizing the STEM education in early childhood by integrating in learning unit or organizing as a project-base management.

4. Pre-service teachers means student teacher who are currently studying in 5^{th} year in early childhood education in professional teacher development school in academic year 2018.

C. Research Instrument: the tools used in this research are questionnaire on status and problem in organizing the STEM learning experiences in early childhood education of pre-service teachers and the ability assessment from providing the STEM education in early childhood of pre-service teacher.

1. The status and problem in organizing the STEM learning experience in early childhood education of pre-service teachers questionnaire was designed as a quality rating scale with 5 assessments level as following: the status and problem at the most highest level, the status and problem at high level, the status and problem at the medium level, the status and problem at low level, the status and problem at the lowest level. The content in the questionnaire were divided into 3 parts as following: Part 1: General information of the respondents, Part 2: The status and problem in organizing the STEM education in early childhood education of pre-service teacher, which consists of 4 aspects, containing 25 choices as following: 1. School management policy aspect, 2. Mentor teacher aspect, 3. Parent's participation aspect and 4. Pre-service teacher's learning management aspect. Part 3: Problems and other recommendations, in which, values corresponding to the purpose and the appropriateness of the content**.** The index of congruence **(**IOC**)** valued between 0**.**80-1**.**00 and the efficiency of the questionnaire was formed at 80**.**22/80**.**45**.**

2. The ability of pre-service teacher in organizing the STEM learning experience in early childhood education questionnaire was designed as a quality rating scale with 5 assessments level as following: the ability of pre-service teacher in organizing the STEM learning experience in early childhood education at the highest level, the ability of pre-service teacher in organizing the STEM learning experience in early childhood education at high level, the ability of pre-service teacher in organizing the STEM learning experience in early childhood education at the medium level, the ability of pre-service teacher in organizing the STEM learning experience in early childhood education at low level, the ability of pre-service teacher in organizing the STEM learning experience in early childhood education at the lowest level. The content in the questionnaire consists of 3 parts as following: Part 1: General information of respondents, Part 2: The ability of pre-service teachers in organizing the STEM education in early childhood education which consists of 4 aspects, containing 30 choices as following 1. The ability to design teaching class and teaching preparation 2. The ability in organizing the medium used in the STEM learning experience 3. Learning resources and 4. Measurement and evaluation. Part 3: Other recommendations. The index of congruence **(**IOC**)** valued between 0**.**80-1**.**00 and the efficiency of the questionnaire was formed at 80**.**32/80**.**51**.**

D. Data Collection: The researcher conducted data collection using questionnaires and assessment forms to the 5th year of pre-service teacher, studying in early childhood education in professional teacher development school in academic year 2018, with the total number of 50 respondents during November 2018 – May 2019.

E. Analyzing the data and statistic: The data analysis and statistics used in this research included the index of congruence **(**IOC**),** the content validity, the reliability calculation and the reliability of Cornbrash's alpha coefficient (a-Coefficient), Percentage, Mean (Standard deviation) and t-test method**.**

RESEARCH RESULTS

Part 1: Respondent's general data analysis results

From the research results analysis, the researcher found that general information of the respondents was female of 49 persons, representing at 98 percent and 1 respondent of male, representing at 2 percent. The most of respondents were on duty in schools under the Office of Basic Education (SES) at the highest score of 40 percent which refer to 20 respondents followed by working on duty in schools under the Office of Education Bangkok, 16 respondents which representing 32 percent and by working on duty in school under the Office of the Private Education Commission, 14 persons which representing 28 percent. The level of teaching class is kindergarten 2 (4 years) and kindergarten 3 (5 years) were the same amount as 17 respondents, representing 34 percent and kindergarten class 1 (3 years) 16 respondents which representing 32 percent respectively.

Part 2: The research results of the status and problems in organizing the STEM learning experience in early childhood education of pre-service teachers

From the research results analysis, the researcher found that in organizing the STEM learning experience in early childhood education of pre-service teachers, the results information indicated that the status and problems arose from organizing the STEM learning experience in early childhood education in which, the data were analyzed from the questionnaires by using means and standard deviation accordingly.

Table 1
Means and standard deviation, of the status and problems in organizing the STEM learning experience in early childhood education of pre-service teachers

Research Aspects	Practice Level		Interpretation	Problem Level		Interpretation
	$\bar{x}$	S.D.		$\bar{x}$	S.D.	
1. School policy	3.30	0.96	Medium level	2.25	0.98	Low level
2. Mentor teacher	3.57	0.87	Good level	2.32	0.89	Low level
3. The participation of parents, community and society	3.28	0.98	Medium level	2.35	0.91	Low level
4. Organizing learning experience of pre-service teachers	3.95	0.80	Good level	2.19	0.83	Low level
Total average score	3.53	0.89	Good level	2.30	0.85	Low level

From table 1, the researcher found that the operating status in organizing STEM learning experience in early childhood education of pre-service teachers who studying in professional

teacher development school was at good level ($\overline{x}$ = 3.53, S.D.=0.89) and the problems of organizing STEM learning experience in early childhood education of pre-service teachers were at a low level ($\overline{x}$ = 2.30, SD = 0.85). When considering each aspect, the researcher found that, in terms of operating conditions, the professional teacher development school has many aspects that promoted the STEM learning experience in early childhood education of pre-service teachers at medium - good level and many aspects were ranked in good level such as the pre-service teacher aspect in organizing STEM learning experience was at ($\overline{x}$ = 3.95, S.D.=0.80), followed by mentor teachers aspect which was ranked at ($\overline{x}$ = 3.57, S.D.=0.87) The research result also indicated the ranking at medium level in many aspects which was rated on school policy followed by the participation of parents, community and society at ($\overline{x}$ = 3.57, S.D.=0.87) and ($\overline{x}$ = 3.28, S.D.=0.98) respectively.

As for the problem conditions, the researcher found that the problems in 4 aspects, which are the school policy, the mentor teacher, the participation of parents, community and society and the aspects in organizing the learning experience of pre-service teachers were all at the same level, which was at low level.

Table 2
The comparison research result of average scores and standard deviation on the status and problems in organizing STEM learning experience in early childhood education of pre-service teachers

Status and problem	N	$\bar{x}$	S.D.	t	Df
Operating conditions	50	3.94	0.68	40.296	49
Problem condition	50	2.29	0.86	18.98	49

** statistically significance at the level of 0.05

From Table 2, the researcher found that the conditions in organizing STEM learning were at a good level. Moreover, pre-service teachers' opinions on problem condition was at low level. The relationship of these two aspects was statistically significance at the level of 0.05.

Part 3: The research result analysis of the ability to organized the STEM learning experience in early childhood education of pre-service teachers

The research result analysis of the ability to organized the STEM learning experience in early childhood education of pre-service teachers, the data were analyzed from the questionnaire by using means and standard deviation accordingly.

Table 3
Means and standard deviation, of ability in organizing the STEM learning experience in early childhood education of pre-service teachers

Area of ability	Skills level		Interpretation
	$\overline{x}$	S.D.	
Designing and preparation of teaching class	3.86	0.72	Good Level
Organizing learning experiences	4.10	0.66	Good Level
Using media and learning resources	3.89	0.69	Good Level
Measurement and evaluation	3.74	0.86	Good Level
Total average score	3.94	0.68	Good Level

From Table 3, the researcher found that the ability in organizing STEM learning experience in early childhood education of pre-service teachers, the overall picture was at a

good level in all aspects at ($\overline{x}$ =3.94, S.D.= 0.68). When considering each aspect, the researcher found that the ability in organizing the learning experience was the highest level at ($\overline{x}$ =4.10 , S.D.= 0.66) , followed by the ability in using media and learning sources at ($\overline{x}$ =3.89 , S.D.= 069) and the ability to design and prepare teaching class was at ($\overline{x}$ =3.86 , S.D.= 072) accordingly.

Table 4
The comparison research result of average scores and standard deviation on the ability in organizing STEM learning experience in early childhood education of pre-service teachers

Area of ability	N	$\overline{x}$	**S.D.**	t	df
The ability in organizing the STEM learning experiences	50	3.94	0.68	40.296	49

** statistically significance at the level of .05

From Table 4, the researcher found that the overall ability in organizing STEM learning experience in early childhood education of pre-service teachers was at a good level ($\overline{x}$= 3.94, S.D.=0.68)

CONCLUSION AND FUTUREWORK

1. Research conclusion

From the research result in organizing the STEM learning experience in early childhood education of pre-service teachers, the researcher found that

1. The status and problem aspect, the professional teacher development school in school policy, mentor teachers, parent's participation and pre-service teachers in organizing the learning experience, the overall score was at good level ($\overline{x}$ = 3.53, S.D.=0.89) and the problem condition in organizing STEM learning experience in early childhood education of pre-service teachers, was at low level ($\overline{x}$= 2.30, S.D.=0.85)

2. The ability in organizing STEM learning experience in early childhood education of pre-service teachers, was at good level ($\overline{x}$=3.94, S.D.= 0.68)

2. Research result discussion

1. The status and problem result in organizing the STEM learning experience in early childhood education of pre-service teachers

1.1 The most respondents were female rather than male who conducting pre-service in teaching at the professional teacher development school, under the Office of Basic Education, Bangkok Education Office and the Office of the Private Education Commission, in which has passed the quality assurance through external quality assurance organization at the highest level. However, each school is highly different in terms of educational management form, teachers, budget and basic knowledge and background of children and parents. Anyhow, every schools use the same early childhood education curriculum year 2017 as a core in developing school curriculum (Department of Academic Affairs [7].

1.2 The status and problem condition in organizing the STEM learning experience in early childhood education of pre-service teachers, the operational level of the professional teacher development school in school policy, mentor teacher, parent, community and society's participation as well as the aspects in organizing the learning experience of pre-service teachers were all at good level, each school is different in terms of school policy, even

though using the same early childhood curriculum year 2017, but the focus of each school is different. For example, schools under the Office of the Private Education Commission will focus more on teaching, reading, writing, they have more budget on STEM education, therefore could allow pre-service teachers to organize a better learning experience. In addition, the model and policy of each early childhood school is different. These policies are therefore an important factor that makes the learning experience of students completely different in which corresponds to Tyner [8]. The supportive and cooperation from all parties such as from administrators, teachers and the community play an important roles in organizing STEM education management, which related to Nuchnapa Rajniyom [9] who has studied about the problems and readiness of STEM educational managnement in Bangkok and found that the factors that contributed to the successful learning management were educational policy, budget, parent's participation and knowledge of teachers through training program especially on STEM education. As for the problems in organizing the STEM learning experience in early childhood education or pre-service teachers was at low level this is because they have adaptability skills, team work skills, planning skills as well as problem solving skills. This is related to Chalatip Samahitoh [10] Suphanwadee Waiyaroop and Bhanit Yenkae [11] who has found the problem of STEM learning management in early childhood education and suggesting ways to solve problems is to organizing the STEM education in suitable educational level.

2. The ability in organizing the STEM learning experience in early childhood education of pre-service teachers

The ability in organizing the STEM learning experience in early childhood education of pre-service teachers was at a good level, both planning, designing, teaching preparation, organizing STEM learning experience, using media and learning as well as measurement and evaluation. This is because pre-service teachers have passed the training and have a chance to conduct their pre-service teaching, use a variety of teaching methods both integrating the content of learning and the project that corresponds to the daily life of the child, according to Hall [11] and Jolly [12] have recommended. In addition, the researcher found that, the most integration in STEM education in early childhood education was under the Office of Basic Education, and the least integration was found under the office of Bangkok Education because lacking of budget to support learning media purchasing. As for the schools under the Office of Private Education Commission will organize their learning management through project work every semester, which is consistent with the research results of Chularat Thammaprathip and Chaniphan Jatisathien [13] who have studied the development of understanding and the STEM education by implementing cooperative professional teacher development program.

3. Suggestion for future use:

1. Should study the effect of the STEM learning experience towards the development of early childhood.

2. Should study the development of the ability in organizing the STEM education project for early childhood 3. The School should develop the knowledge and ability of the mentor teacher to be used as a guideline for more effectively in teaching of pre-service teacher respectively.

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