



The Development of Training Curriculum to Enhance Information and Communication Technologies Skill for Pre-service Teachers

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Abstract

This study aims at 1) developing a training curriculum to enhance the skills of using Information and Communication Technologies (ICT) for pre-service teachers; and 2) to examine results of experiment in using the training curriculum. The participants were 113 pre-service teachers from 4 classes of Early Childhood Education Program, Faculty of Education, Phuket Rajabhat University. These students were studying in year 1 to year 4. To collect the data, a set of training curriculum, achievement tests and a questionnaire were employed. The obtained data were statistically analyzed using average score, standard deviation and effectiveness index value. The results revealed that 1) the training curriculum which consisted of four contents including the use of Google Drive for collaborative online working, the use of Google Sites to create Electronics Portfolio (E-Portfolio), the use of PowerPoint program to design Multimedia for Education and the use of applications and tools to create a form to receive and analyze the data for research conducting was appropriate to use to train ICT skills to pre-service teachers at the highest level; 2) The results of the experiment in using the training curriculum were as follows: the effectiveness index values of participants' learning outcomes in each content were 61.96 percent, 71.92 percent, 68.79 percent and 65.87 respectively. These values were higher than 60 percent which was the specified value; and the participants were satisfied with all contents of the training curriculum at the highest level.

Keywords: Training Curriculum, Information and Communication Technologies Skills, Pre-service Teachers

Introduction

To produce quality in-service teachers to serve the needs of schools in 21st century, all instructors or teacher training institutions are required to develop skills of their pre-service teachers in several dimensions. Dachakupt & Yindeesuk (2014) have identified the six key qualities that Thai teachers should have including 1) morality; 2) computer competency; 3) course and curriculum development ability; 4) teaching management competency; 5) learning outcomes evaluation competency for classroom action research conducting; and 6) positive classroom management competency. Similarly, Sinthapanon (2015) has concluded nine significant qualifications of Thai teachers in the 21st century as 1) being able to learn and use new technologies, identify advantages and disadvantages of technologies, and being able to instruct learners to correctly use any kinds of technology and appropriately use it to search for information; 2) being able to invent innovations enabling learners to reach learning and social skills as they are the goals of educational reform in the 21st century; 3) being able to measure and evaluate learning outcomes of learners concerning learning objectives and learning standards, and being able to conduct classroom research to develop learners. Also, Laohajaratsang (n.d.) has pointed out that the required skill of future Thai teachers (C-Teacher) in terms of ICT Integration is the use of technologies to support classroom management and activities which could finally lead to a development of effective thinking processes of learners. Especially in applying it to suit the current teaching and learning management (2019-present) due to problems with the COVID-19 pandemic. Many countries have introduced Internet systems and online platforms for continued learning such as Argentina, Croatia, China, Cyprus, Egypt, France, Greece, Italy,



Japan, Mexico, Portugal, South Korea, Saudi Arabia. United Arab Emirates and the United States. (Chang & Yano, 2020)

In the 21st century, it is clearly accepted that one of students' important skills especially for pre-service teachers who are going to be future in-service teachers is the ICT skills. Thus, this group of students is required to be master of ICT literacy skills. In other words, they must be able to apply the ICT skills to their study throughout the curriculum and further use the skills for working as a teacher in the future. However, most academic programs, except computing curriculum programs, offer only few subjects relevant to ICT skill development to their students (Kim, Jung, & Lee, 2008; García-Valcárcel & Tejedor, 2009; Palomino, 2017). In response to the strategy no. 1.4 of the university work manual of annual action plan and budget 2019 which stated on the development of students to have required student characteristics of 21st century and Thailand 4.0 (Policy and Planning Division, 2018), these teachers and institutions will allot a budget to organize extra courses to increase ICT skills of their students annually.

The researcher, as being one of lecturers teaching pre-service teachers in the computer education program at the Faculty of Education as well as being the speaker of many ICT training projects for pre-service teachers of other academic programs and for in-service teachers working in schools, has observed that the different groups of people requires wanted to learn different kinds of ICT skills. Therefore, this raises the researcher's interest in developing a training curriculum to suitably enhance the skill of using ICT skills for pre-service teachers studying in each year, and finally increase their ability to apply the ICT skills to their study and teacher profession in the future.

Research Objectives

1. To develop a training curriculum to enhance the skills of using Information and Communication Technologies for pre-service teachers.
2. To examine results of experiment in using the training curriculum.
 - 2.1 To explore the effective index values of learning outcomes of pre-service teachers' studying in year 1-year 4 whether it is more or less the same as 60 percent.
 - 2.2 To investigate the satisfaction of pre-service teachers towards the training curriculum.

Material and Methods

Population and Sample

Population: 1,497 undergraduates include ten Program in Faculty of Education Phuket Rajabhat University, Academic Year 2018.

Sample: Through a simple random sampling, 113 pre-service teachers studying in Early Childhood Education Program at Faculty of Education participated in this study. This included 27 first year students, 27 second year students, 32 third year students, and 27 fourth year students.

Instruments

The following instruments were assessed for quality:

1. The researcher designed a five-point Likert Scale questionnaire concerning the Appropriateness of the Training Curriculum on ICT for Pre-Service Teachers by three experts to verify the content consistency, clarity



of questions, and language accuracy. From the analysis, the range of Index of Item Objective Congruence (IOC) is 0.67–1.00.

2. A set of multiple-choice tests was designed to evaluate knowledge and understanding of participants on the learning contents relevant to the training curriculum. Each learning content consists of 30 questions, and each question has 4 choices. The IOC index ranged from 0.67–1.00, The test was subsequently assessed for reliability using KR-21, It was discovered that the test on the use of Google Drive for collaborative online working had its reliability coefficient at 0.82, the test on the use of Google Sites to design E-Portfolio had its reliability coefficient at 0.71, the test on the use of PowerPoint program to create Multimedia for Education had its reliability coefficient at 0.71 and the test on the use of tools to create a form for receiving and analyzing research data had its reliable coefficient at 0.63 respectively.

3. A five-point Likert Scale questionnaire concerning the Satisfaction towards the Training Curriculum by three experts to verify the content consistency, clarity of questions, and language accuracy. From the analysis, the range of Index of Item Objective Congruence (IOC) is 0.67–1.00.

The Research Procedure

Step 1: The Researcher Studied the Necessary ICT Skills which are Important to Pre-Service Teachers. to collect the data from five lecturers in each academic department, the researcher sent a memorandum to heads of ten academic departments of the Faculty of Education at Phuket Rajabhat University.

Step 2: The Researcher Developed the Curriculum and Curriculum Manual Following these Steps:

1. The researcher developed a draft of ICT training curriculum for pre-service teachers by following these procedures: 1) identifying problems and the significances of the curriculum; 2) defining the objectives that were suitable to ICT skills of students studying in each year (Year 1–4); 3) specifying the content structure of the training curriculum; 4) determining curriculum processes and activities; 5) designing curriculum materials; 6) planning about the curriculum measurement and evaluation; and 7) designing a criterion for passing the curriculum.

2. Three experts were invited to evaluate the appropriateness of the training curriculum.

Step 3: Training Curriculum Trial

The researcher employed a one group pre-test and post-test design (Kaiwan, 2016) procedures were as follows:

1. Pre-Training Curriculum:

1.1 The researcher contacted lecturers of each academic department to ask and make an appointment about the date and time to arrange the training curriculum to students studying in each year.

2. Training Curriculum Trial:

2.1 The researcher invited pre-service teachers participating in the study to attend a pre-test in order to evaluate their background knowledge of ICT.

2.2 Then, the training curriculum was organized following the provided manual, and the researcher measured the learning progresses of pre-service teachers using prepared worksheets. Each training curriculum session lasted 8 hours.

2.3 After the training is finished Conducted another measure of knowledge of the trainees.



3. Post-Training Curriculum:

3.1 The questionnaire was distributed to the participants to evaluate their satisfaction towards the training program.

Step 4: Training Curriculum Evaluation

Results

The Results from Development of Training Curriculum

The results from investigating and analyzing the data relevant to the necessary ICT skills of pre-service teachers revealed that the first year students needed more training courses on the use of ICT for studying while the second year students required E-Portfolio creation method. In addition, the third year students wanted to be trained on a production of instructional media and innovations to specifically support their learning in each academic department, and the fourth year students required extra courses on the use of computer applications and programs to analyze the data for research conducting. Moreover, the results also suggested four important curriculum contents for each year of pre-service teachers which were 1) the use of Google Drive for collaborative online working for the first year students; 2) the use of Google Sites to create E-Portfolio for the second year students; 3) the use of PowerPoint program to design Multimedia for Education for the third year students; and 4) the use of tools and applications to create a form to receive and analyze the research data for the fourth year students. All these learning contents were statistically evaluated in terms of its appropriateness to use and reported in Table 1.

Table 1 Mean, Standard Deviation, and the Appropriateness to Use of the Training Curriculum on ICT for Pre-Service Teachers

Items	\bar{x}	S.D.	Level
Problems and Significances of the Training Curriculum			
1. It is necessary to develop a training curriculum.	5.00	0.00	Highest
2. The training curriculum meets the recent requirement of academic programs and students.	5.00	0.00	Highest
Total Score	5.00	0.00	Highest
Objectives of the Training Curriculum			
1. The objectives suit participants' skill levels.	4.67	0.58	Highest
2. The objectives are clear, and they enable the participants to develop ICT skills and use them to perform any tasks.	4.67	0.58	Highest
Total Score	4.67	0.58	Highest
Curriculum Structure			
1. Contents of the training curriculum are appropriate and connected with the curriculum objectives.	4.67	0.58	Highest
2. Contents of the training curriculum are arranged orderly and properly.	4.67	0.58	Highest
3. Proper time management is provided for each learning content.	4.33	0.58	High
4. The curriculum contents are suitable with the participants.	4.67	0.58	Highest
Total Score	4.58	0.38	Highest
Training Curriculum Processes and Activities			
1. The activities are suitable for training pre-service teachers.	4.67	0.58	Highest
2. There is a possibility to achieve the curriculum objectives.	4.67	0.58	Highest
3. Proper time management is provided for each activity.	4.33	0.58	High
Total Score	4.56	0.51	Highest

**Table 1** (Cont.)

Items	\bar{X}	S.D.	Level
Training Curriculum Materials			
1. Materials are appropriate to use.	4.67	0.58	Highest
2. Materials used in the training curriculum can lead to objective achievement.	5.00	0.00	Highest
Total Score	4.83	0.29	Highest
Training Curriculum Measurement and Evaluation			
1. Measurement and evaluation are appropriate to use.	4.67	0.58	Highest
2. There is a possibility to apply the measurement and evaluation process to evaluate the participants' learning outcomes after attending the curriculum.	4.67	0.58	Highest
Total Score	4.67	0.58	Highest
Criteria for Training Curriculum Pass			
1. There is a proper criterion for training curriculum pass.	4.67	0.58	Highest
2. There is a possibility to use the criterion for evaluating the participants' learning outcomes after attending the curriculum.	4.67	0.58	Highest
Total Score	4.67	0.58	Highest
Total Score	4.69	0.40	Highest

From Table 1, it showed that the overall picture of the appropriate level of the training curriculum was in the highest level ($\bar{X} = 4.69$). When considering each dimension, it was discovered all dimensions were appropriate to use at the highest level. Especially on the issue of Problems and Significances of the Training Curriculum ($\bar{X} = 5.00$).

The Results of the Experiment in Using the Training Curriculum

1. The effectiveness index value of first year students' learning outcomes after being trained about the use of Google Drive for collaborative online working.

Table 2 The Effectiveness Index Value of Participants' Learning Outcomes after Being Trained on the Use of Google Drive for Collaborative Online Working

Number of Participants	Full Score	Total Score		Effectiveness Index Value
		Pre-Test	Post-Test	
27	30	413	659	0.6196

From Table 2, it showed that the average pre-test score of the participants was 413, but the average post-test score became 659. When being calculated with the effectiveness index formula, it yielded 0.6196 which meant the average score of the participants after being trained was higher at 61.96 percent.

2. The effectiveness index value of the second year students' learning outcomes after being trained on the use of Google Sites to create E-Portfolio.

Table 3 The Effectiveness Index Value of Participants' Learning Outcomes after Being Trained on the Use of Google Sites to Create E-Portfolio

Number of Participants	Full Score	Total Score		Effectiveness Index Value
		Pre-Test	Post-Test	
27	30	347	680	0.7192



From Table 3, it was found that the average score of participants' pre-test was 347 while their average score of post-test was 680. After analyzing with the effectiveness index formula, it revealed that the effectiveness index value was 0.7192 which stated that the average score of the participants has been increased at 71.92 percent.

3. The effectiveness index value of the third year students' learning outcomes on the use of Power Point program to create Multimedia for Education.

Table 4 The Effectiveness Index Value of Participants' Learning Outcomes after Being Trained on the Use of Power Point Program to Create Multimedia for Education

Number of Participants	Full Score	Total Score		Effectiveness Index Value
		Pre-Test	Post-Test	
32	30	364	774	0.6879

From Table 4, it was discovered that the average score of participants' pre-test was 364 while their average score of post-test was 774. When being statistically computed with the effectiveness index formula, effectiveness index value revealed 0.6879 which indicated that the average score of the participants was higher at 68.79 percent.

4. The effectiveness index value of the fourth year students' learning outcomes on the use of tools and applications to create a form for receiving and analyzing research data.

Table 5 The Effectiveness Index Value of Participants' Learning Outcomes after Being Trained on the Use of Tools and Applications to Create a form for Receiving and Analyzing Research Data

Number of Participants	Full Score	Total Score		Effectiveness Index Value
		Pre-Test	Post-Test	
27	30	347	652	0.6587

From Table 5, it was discovered that the average score of participants' pre-test was 347. However, the average post-test score became 652 after being trained. When being analyzed with the Effectiveness index formula, it revealed that the effectiveness index value was 0.6587. This could also show that the average score of the students increased after being trained at 65.87 percent.

Moreover, the researcher used a questionnaire to survey participants' attitudes towards the training curriculum. To do so, five-point Likert Scale was employed, and the questionnaire results are presented in the Table 6.

Table 6 Mean, Standard Deviation, and the Participants' Satisfaction towards the Training Curriculum

Items	\bar{x}	S.D.	Level
The use of Google Drive for collaborative online working.	4.76	0.29	Highest
The use of Google Sites to create E-portfolio.	4.80	0.38	Highest
The use of PowerPoint program to design Multimedia for Education.	4.77	0.26	Highest
The use of tools and applications to create a form for receiving and analyzing research data.	4.77	0.22	Highest
Total Score	4.77	0.29	Highest

Table 6 indicated that, in general, the participants were satisfied with the contents and activities of the training curriculum at the highest level ($\bar{x} = 4.77$). The most preferable training session was the use of Google



Sites to create E-portfolio ($\bar{x} = 4.80$). Also, they were very happy to study with other learning contents at the highest levels; the use of PowerPoint program to design Multimedia for Education ($\bar{x} = 4.77$); the use of tools and applications to create a form for receiving and analyzing research data ($\bar{x} = 4.77$); and the use of Google Drive for collaborative working ($\bar{x} = 4.76$).

Discussion and Conclusion

To develop a training curriculum, the researcher has planned to design and develop it according to the required processes of curriculum development. Those processes included surveying views and suggestions of experts, specifying clear curriculum objectives, being careful in choosing and arranging learning contents, determining on the time allowance for each learning content, selecting a provision of learning experience, arranging a provision of training curriculum's learning experience and using a proper method to measure and evaluate participants' learning outcomes. All these processes were based on the Taba (1962) framework called "Grass roots approach". In other words, it is the bottom-up approach which believes that a teacher or an instructor of the course should be a part of curriculum development by involving in these seven steps including 1) analyzing needs of participants and academic programs; 2) specifying objectives; 3) selecting learning contents; 4) sequencing learning contents; 5) selecting a provision of learning experience; 6) arranging a provision of learning experience; and 7) measuring and evaluating (Jakchum, 2016).

A part from this, the content which was suitable to teach the first year students was the use of Google Drive for collaborative online working while the second year students needed to be trained on the use of Google Sites to create E-portfolio. The third year students required the use of PowerPoint program to create Multimedia for Education, and the fourth year students were suitable to study the use of tools to create a form for receiving and analyzing research data. The use of the right contents with the right group of students made this curriculum suitable for training ICT to pre-service teachers at the highest level. Especially, the dimension 'problems and significance of the training curriculum', which had average score at 5.00, could confirm that the curriculum can be used to train ICT skills to each year of pre-service teachers significantly. Especially in applying it to suit the current teaching and learning management due to problems with the COVID-19 pandemic.

In terms of the curriculum trial, the researcher taught all learning contents to the participants, they were also asked to perform activities and tasks. As a result, the effectiveness index values of all learning contents were higher than the specified value. This might be because the learning contents of the training curriculum suited the needs of the target participants as it was developed following the results of a suitability assessment of necessary ICT skills shared by pre-service teachers studying in each year. This is consistent with Thammasukseree, Sukkamart, & Papat (2016) study of the development of a short training course on Thai dessert. The suitability assessment of this training course was also at the highest level, and the average score of post-test completed by participants was higher after participating in the short training course. In addition, Thammasukseree et al. (2016) mentioned that the development of any training courses should be based on the survey of needs, interests and problems of the target participants. More importantly, all data obtained from the target participants should be analyzed and used to develop the course under the appropriate course development processes. During the training processes, teachers or instructors should specifically focus on giving knowledge and asking participants to perform training activities at the same time. This could finally enable students to develop ICT skills. This is similar to Jakchum's (2016) study. He developed the training curriculum following the blended



learning notion to enforce students' ICT skills. The curriculum emphasized on actual practices and the theory that urged the increase of ICT competency of learners and the effectiveness index values of their learning outcomes. Besides, the majority of participants agreed that they obtained more ICT knowledge and skills after being trained. Also, the curriculum contents were useful, and they can be applied to perform in-service teachers' duties in the future. The students suggested that the university should provide this kind of training to them every year.

Suggestions

1. Suggestions for the Curriculum

During the training sessions, teachers or instructors should carefully manage the time allowance for each learning session as the participants were required to create works or worksheets which usually needed time to finish them. If the teachers could not properly manage the time, it would made the participants unable to complete all the curriculum contents and tasks especially the topic 'the use of PowerPoint program to create Multimedia for Education'. This topic required participants' actual practices in every steps, and the students would need more time to study when comparing to the other three topics.

2. Suggestions for Further Study

2.1 As the developed curriculum was designed specifically to suit requirements of each year of pre-service teachers, instructors or lecturers should follow-up the results of the curriculum arrangement throughout academic years. At the end of each academic semester, lecturers can observe or ask about the use of ICT from their students. This could help the lecturers investigate the concrete outcomes of how much ICT skills their students have used and developed after being trained.

2.2 To use the curriculum to train ICT skills to the 1st-4th year pre-service teachers, it requires a huge amount of budget. In order to make it more practical, the program can redesign the curriculum to become an online ICT optional course known as Massive Open Online Course (MOOC). This would allow the students to access and learn the curriculum contents at any places and times. Also, the program might assign the students to attend one of four learning contents in each academic year, and require them to complete all the four learning contents before attending an internship course.

2.3 The developed curriculum was fundamentally designed to develop ICT skills of pre-service teachers. However, every academic department is unique, and each requires different ICT contents to train their students. Therefore, an additional curriculum in the form of MOOC should be further developed to suit the nature of students studying in each academic department. By doing so, the students will have more choices of training courses to choose, and they can truly choose it according to their needs.

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