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Abstract. The purpose of this research was to: 1) analyze and synthesize STEM Education learning and innovation skills model on cloud computing technology to promote learning and innovation skills for students practicing teachers. 2) To learning and innovation skills Education teaching model, study on cloud computing technology to promote learning skills and innovation for students practicing teachers. 3) Evaluate the developed learning model by 6 experts in STEM education on cloud computing technology, using specific selection. With a sample group of experts in techniques and teaching methods Information and communication technology, 6 persons, using a specific selection The tools used in the research were 1) A learning model of STEM Education on cloud computing technology to promote learning and innovation skills for students practicing teachers 2) Assessment form for opinions about conceptual framework and 3) Suitability assessment form Analyze data using arithmetic mean and standard deviation. **The results of the research** were as follows: 1) The learning model consisted of 1.1) STEM supervision process 1.2) Learning and Innovation Skills 1.3) Users of the format comprised of teacher students and 1.4) Cloud processing technology 2) Opinions about the results of the analysis and synthesis of Full teaching and learning style, based on STEM Education on cloud computing technology to promote learning and innovation skills for students practicing teachers Overall, the level of opinion is at the highest level ($\bar{x} = 4.67$, S.D. = 0.35) and 3) Appropriateness of Full teaching and learning style, based on STEM Education on cloud computing technology to promote learning and innovation skills for students practicing teachers. Consisting of the suitability of the design of the pattern and the appropriateness of applying the model to actual use the overall picture is at the highest level ($\bar{x} = 4.83$, S.D. = 0.24)

Keywords: Learning styles, STEM learning, Cloud Computing Technology, Learning and innovation skills

Introduction

There is a limited amount of research that examines the prerequisite skills, beliefs, knowledge bases, and experiences necessary for teachers to implement integrated instruction (Fykholm & Glasson, 2005). For integrated Science, Technology, Engineering, and Mathematics (STEM) education, since it is relatively new, this statement rings even more true.

STEM had its origins in the 1990s at the National Science Foundation (NSF) and has been used as a generic label for any event, policy, program, or practice that involves one or several of the STEM disciplines. However, a recent survey on the “perception of STEM” found that most professionals in STEM-related fields lacked an understanding of the acronym STEM. Most respondents linked the acronym to “stem cell research” or to plants (Keefe, 2010). Once again, the education community has embraced a slogan without really taking the time to clarify what the term might mean when applied beyond a general label. When most individuals use the term STEM, they mean whatever they meant in the past. So STEM is usually interpreted to mean science or math. Seldom does it refer to technology or engineering, and this is an issue that must be remedied. If STEM education is going to advance beyond a slogan, educators in the STEM community will have to clarify what the acronym actually means for educational policies, programs, and practices. The following discussion presents several things that STEM might mean for contemporary education. First, it may mean recognition that science education has been diminished during the No Child Left Behind era, which is ending. The reauthorization of the Elementary and Secondary Education Act (ESEA) could underscore the importance of science, and by their close association, technology and engineering, in school programs.

This paper focuses on building a model named A Learning model of STEM Education on cloud computing technology that aims at to promote learning and innovation skills for students practicing teachers at Chaiyaphum Rajabhat University. One research question has been addressed: Will the model of STEM Education on cloud computing technology Suitable for use with students practicing real teacher experience?

Research objectives

1. To analyze and synthesize the learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers.
2. To design the learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers.
3. To evaluate teaching and learning styles learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers..

Method

Population and sample

The population is expert, divided into 2 areas, consisting of techniques and teaching methods. Information and communication technology. The sample group is expert, divided into 2 areas, consisting of 3 techniques and methods of teaching, and 3 people in information technology. By having experience in related fields for at least 3 years.

Variables used in the study

The default variable is learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers.

The dependent variable is the evaluation result on learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers.

Method The research is divided into 3 objectives:

Objective 1: Analysis and synthesis on learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers with educational procedures and analysis from relevant theoretical and research papers

Objectives 2: Design the learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers.

Objective 3: Design evaluation the learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers.

Research tools

1. learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers.
2. Assessment form for analysis and synthesis results on learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers. Looks like a 5 level rating scale (Rating Scales)
3. Suitability assessment form learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers. Looks like a 5 level rating scale (Rating Scales)

Research result

Part 1 Analysis and synthesis of frameworks learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers. Consists of 3 aspects:

1. Input Analysis

1.1 Cloud computing technology Is the use of various computer resources Whether hardware, software and communication networks From service providers to share usage for many users Individuals in order to maximize the use of computer resources Which will help users save costs [2]. With the form of software as a service (SaaS) which is a computer program service (Application) To use together at anytime, anywhere, every device with the necessary computer program services and suitable for the users [5]

1.1.1 Email application for sending or ordering work between teachers and students easily fast with Gmail and Hotmail services etc.

1.1.2 Application of electronic lessons (e-Learning) such as wordpress.com, slide share, net and YouTube etc. Teaching materials in text format and video clip from digital camera. Send to the system with the printing of lesson content or homework. Including being able to linking the ability between the webs to create creative features students can easily

1.1.3 Application of unlicensed applications and can be used for free for teaching and learning such as online document printing with Google Docs, online scheduling and calculations with Google Sheets and slide creation. Presenting work online with Google Slides etc.

1.1.4 Application of social networks such as Facebook, Wiki and Google Group for communication channels to create a cooperative learning process.

1.2 Learning and Innovation Skills Basic skills that human in the last century 21 everyone must study because the world will change faster and more complicated. People who are weak in their learning and

innovation skills will be those who follow the world, not being weak. Life will be difficult. Teachers must therefore pay attention. Develop their abilities in this skill to be able to design learning for students to learn and develop skills in their own learning and innovation throughout their lives. How to design learning for students to have this skill is use the principle that children must learn together to create their own knowledge. Learn by creating knowledge and learning as a team. Learning the learning skills (learning how to learn or learning skills) and learning skills to create change in a better way. (Innovation) consists of the following sub-skills.

1.2.1 Critical thinking and problem solving, which means expert thinking.

1.2.2 Communication and cooperation which means complex communication.

1.2.3 Creativity and innovation which means application of imagination and invention.

2. Analysis of Stem learning

STEM Education is a way of learning that integrates 4 knowledge fields: science, technology, engineering and mathematics to connect to situations, problems in life or related to experience of students (Vasquez, et al., 2013) The main characteristics of STEM Education consist of 5 principles as follows:

2.1 Step 1: Identify problems the instructor divides students into groups by using the method of dividing between learners who have good and fair academic performance. Then the teacher must create interest for the learner to realize the problem solving which can be done in many forms. Such as opening news clips to see real situations, asking questions, etc. This step is to help learners understand the source of the problem and can identify problems within the group.

2.2 Step 2: Data collection step and concepts related to the problem Is the stage in which the learner plays the main role. The instructor is only a counselor or guide. The students must gather information and concepts related to problem solving. The data collection is that the learner has to search for information on whether someone has found a solution or not, and which suggestions are available. Searching for ideas is that students must find ideas or knowledge related to problems. Such as knowledge in science, mathematics and technology, and students must consider the concept. By considering the feasibility, cost-effectiveness, appropriateness, advantages and disadvantages.

2.3 Step 3: Plan and implement the solution is a step after the learner has chosen the right concept to solve. At this stage, students must define the layout of the solution. Targeting time to practice and plan the operation clearly including having to complete the problem solving.

2.4 Step 4: Testing, evaluation and improvement of work pieces is a step that students must test and evaluate to consider the effectiveness of the work that has been performed. If the work efficiency is poor students must improve the work piece better. By considering the performance recorded. For instructors to act as counselors without answering questions, but using guiding questions until the learner has a solution or answer.

2.5 Step 5: Step-by-step solution for problem solving and problem solving results. Students must present the solution to the problem and the result of solving the problem to the public. To see how to solve the problem Improve their work pieces and work pieces of friends. At this stage, the instructor must perform a summary. Explain more knowledge. After all, the group presented a solution and problem solving results. And guiding the application to students.

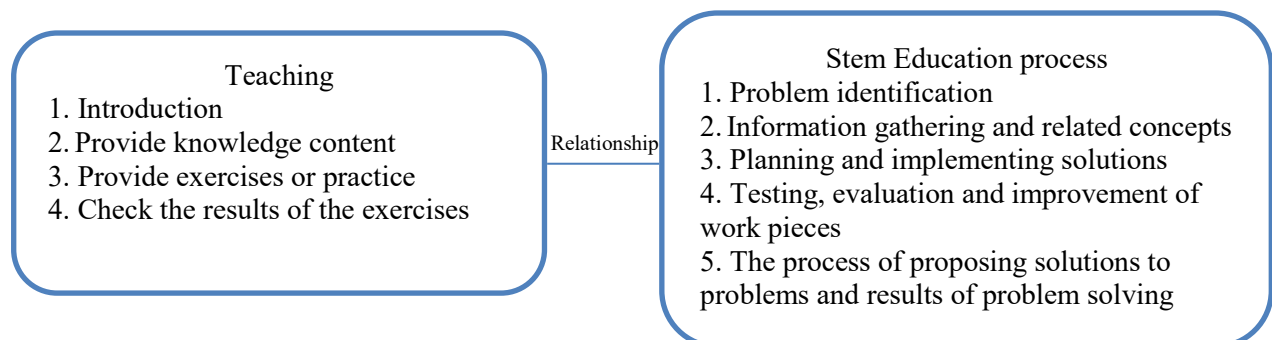


Figure 1 Relationship between the STEM Education process to develop learning and innovation skills

3. Needs Analysis

According to the Office of the Higher Education Commission (2015, pp. 67-71), the internal quality assurance system Course level Composition 3 is mentioned in the production of graduates so that graduates have desirable characteristics. And a quality graduate especially for students to have knowledge and ability as specified by the curriculum And have learning skills in the 21st century, consisting of 4 main groups: 1) Core Subjects 2) Life and Career Skills 3) Learning and Innovation Skills and 4) Information, Media and Technology Skills. In accordance with Anderson's concept [9] that discusses 21st century learning goals with 3R's skills for student development. Consists of Reading, Writing and Arithmetic as well as 4C's skills, including critical thinking and problem solving Creativity and Innovation Communication and Collaboration. This research focuses on the process of teaching supervision by STEM Education process in promoting learning in the 21st century.

Part 1: Designing a Full teaching and learning style, based on STEM Education on cloud computing technology to promote learning and innovation skills for students practicing teachers. That is obtained from the study and analysis of relevant theoretical and research documents as shown in Figure 2 as follows.



Figure 2 A learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers.

From the design of teaching and learning styles, based on STEM Education on cloud computing technology to promote learning and innovation skills for students practicing teachers. The details are as follows

2.1 The STEM learning and teaching process can be divided into 5 steps, which can be applied on the crowd funding technology to promote learning skills and innovation for students practicing teachers as follows.

2.1.1 Step 1 Identify problems The instructor divides students into groups. By using the method of dividing between learners who have good academic performance and weak. Then the teacher must create interest for the learner to realize the solution. Which can be done in many forms such as opening a news clip to see the actual situation, questioning, etc. This step is to make the students understand the source of the problem and can identify the problem together within the group.

2.1.2 Step 2: Gather information and concepts related to the problem. Is the stage in which the learner plays the main role the instructor is only a counselor or guide. The students must gather information and concepts related to problem solving. The data collection is that the learner must search for information on whether someone has found a solution or not, and which suggestions are available. As for the search, the concept is that learners must search for ideas. Or knowledge related to problems such as knowledge in science, mathematics and technology, and students must consider the concept. By considering possible issues, cost-effectiveness, appropriateness, advantages and disadvantages.

2.1.3 Step 3: Plan and implement the solution is a step after the learner has chosen the right concept to solve the problem. At this stage, students must define the layout of the solution. Targeting time to practice and plan the operation clearly. Including having to complete the problem solving.

2.1.4 Step 4: Testing, evaluation and improvement of work pieces is a step that students must test and evaluate. To consider the effectiveness of the work that has been performed if the work efficiency is poor. Students must improve the work piece better. By considering the performance recorded. For instructors to act as counselor without answering questions. But using guiding questions until the learner has a solution or answer.

2.1.5 Step 5: Presentation Step method for solving problems and problem solving results. Students must present the solution to the problem and the result of solving the problem to the public. To see how to solve the problem Improve their work pieces and work pieces of friends. At this stage, the instructor must act as a summary. Explain more knowledge. After all, the group presented a solution and problem solving results. And guiding the application to students.

2.2 Learning and Innovation Skills Learning, learning how to learn or learning skills and learning skills to create change in a better way (innovation) consists of sub-skills as follows. 1) Critical thinking and problem solving, which refers to expert thinking. 2) Communication and cooperation which means complex communication. 3) Creativity and innovation which means application of imagination and invention

2.3 Users of the format include: 1) Instructors 2) Students 4) Manager

2.4 Cloud computing technology It is a technology selection using the SaaS service model (Software as a Services) in the application of STEM Education.

Part 2 Evaluation of learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers.

1. Assess opinions about the analysis and synthesis results learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers.

Table 1 Assess opinions about the analysis and synthesis results of learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers.

Assessment issues	Level Comments		
	\bar{x}	S.D.	Interpret
1. Input analysis results include	4.83	0.24	Most
1.1 Teaching Context			
1.2 Crowd funding technology			
2. STEM Process Analysis	4.67	0.47	Most
3. Needs Analysis	4.33	0.47	Most
Total average	4.67	0.35	Most

From **Table 1** found that Assess opinions about the analysis and synthesis results of learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers. Overall, the level of opinion was at the highest level ($X = 4.67$, $SD = 0.35$). When considering each aspect, it was found that the input analysis was at the highest level ($X = 4.83$, $SD = 0.24$) Followed by the analysis of STEM process analysis in the highest level ($X = 4.67$, $S.D. = 0.547$) respectively.

3.2 Assess the suitability of learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers.

Table 2 Assess the suitability of learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers.

<i>Assessment issues</i>	<i>Level Comments</i>		
	<i>\bar{x}</i>	<i>S.D.</i>	<i>Interpret</i>
1. Appropriateness of the results of the design of learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers.	4.67	0.47	<i>Most</i>
2. The appropriateness of using learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers.	5.00	0.00	<i>Most</i>
<i>Total average</i>	<i>4.83</i>	<i>0.24</i>	<i>Most</i>

From **Table 2**, the result of the suitability assessment of learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers. Overall, the level of opinion is at the highest level ($\bar{x} = 4.83$, S.D. = 0.24). When considering each aspect, it was found that the appropriateness of the instructional model of using learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers to be practical. At the highest level ($\bar{x} = 5.00$, S.D. = 0.00) Followed by the appropriateness of the design results of learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers. At the highest level ($\bar{x} = 4.67$, S.D. = 0.47) respectively

Discussion of research results

1. Opinions of analyzing and analyzing the framework of learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers to be practical. At the highest level ($\bar{x} = 4.67$, S.D. = 0.35) in line with Kankaew and Jeerungsuwan [3] Found that the opinions of experts in the design of learning styles together through cloud technology to promote the creativity of students in higher education. The overall picture is at a high level ($\bar{x} = 4.12$, S.D. = 0.45). It can be used to promote creativity of higher education students.

2. The suitability of the form of learning model of STEM Education on cloud computing technology, to promote learning and innovation skills for students practicing teachers to be practical. Overall, the level of opinion is at the highest level ($\bar{x} = 4.83$, S.D. = 0.24) in line with Srisakonsub and Jeerungsuwan [5]. Found that the appropriateness of the design of cooperative learning styles by cloud technology to develop learning skills in the 21st century for higher education students. The overall picture is at the highest level ($\bar{x} = 4.87$, S.D. = 0.25). That can be used as a channel for learning management in the 21st century. By focusing on activities that are consistent with various skills in the 21st century. From the application of cloud computing technology that combines learning with various media. Whether it is multimedia, photos, videos, including activities in the game format etc. Which students can access and call anywhere anytime without depending on the device and can support a large number of learners.

Suggestions from research

1. Suggestions for research results to be used

Educational institutions that will use this supervision model should study the infrastructure of the network, use of various devices. Including the use of cloud computing technology in teaching management according to the format. The instructor must understand how to apply such technology. In order to be able to complete teaching and learning on cloud computing technology to promote learning and innovation skills for students practicing teachers.

2. Suggestions for further research

Educational institutions should bring the results of the design of this instructional supervision model to trial with undergraduate students. To study the effects of teaching and learning according to the learning style.

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