



THE MODEL OF LEARNING THAT PROMOTES CRITICAL THINKING IN STEM EDUCATION FOR STUDENTS OF FACULTY OF EDUCATION OF SUAN SUNANDHA RAJABHAT

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This research aims to use learning management model based on full rest in the promotion of critical thinking of students, Faculty of Education of Suan Sunandha Rajabhat University. The measurement and evaluation of forms of learning along STEM Education to promote critical thinking of students of the Faculty of Education. The university who are studying in the first semester of the first year in 2015, 60 were used in this research include lesson plans along the STEM Education that fosters critical thinking with the process engineering design five stages. at the 10 plan period of 10 weeks and the tools used to collect information, including assessment of critical thinking skills of students. A multiple-choice answer type, select option four statistics used were percentage, average and standard deviation.

The research found that

1. Finding effective ways of learning along the STEM fields to promote critical thinking of students at four. General Science, Faculty of of Education of Suan Sunandha Rajabhat University. 80/80 The experimental group Found that a form of learning along the STEM Education that were built quality E1 / E2 is equal to 84.20 / 82.64, according to set criteria.
2. The analysis of the ability of critical thinking skills before and after the study, using a form of learning along the STEM Education to promote critical thinking of students at four. General Science, Faculty of Education found that students who have been learning along the STEM Education. Rated capacity of critical thinking skills after class is higher than the previous average of 4.56 percent, 15.20 points.

Keywords: STEM education Critical thinking education.

Introduction

Students are expected to be equipped for the 21st century, including necessary work skills, creativity and the ability to bring innovation and competence to the IT sector, but the number of those studying science and technology falls at every grade level. The Institute for the Promotion of Teaching Science and Technology (IPST) Thailand has initiated a new approach by emphasising knowledge and skills which are suitable to professional life in a highly competitive economy and society. This is known as STEM education

STEM education is a learning innovation in which science, technology, engineering and mathematics are integrated. This approach engages learners in applying knowledge to problems in daily life, as well.

Another outstanding feature of STEM education is integration, which helps students connect knowledge from the four disciplines with their daily and professional lives. Besides skills in analytical

thinking and creating innovations, STEM education has learners understand and have an increased interest in STEM-related careers.

The purpose of my courses has been to further their understanding of pedagogical approaches, and to enable them to instruction design from my teaching experience. Concluded that although my students understand basic science. But they are not designed to promote the teaching of thinking skills. Such problems led me to conclude that I interested a STEM Education in my teaching to promotes critical thinking for my student

Objectives

The purposes of this research were

1. To study the implementation result of learning organaization based on STEM Education on instructional design ability of students teachers.
2. To compare the critical thinking ability of pretest and posttest learning though STEM Education of students teachers.

Methodology

This researcher used One Group Pretest - Posttest Design (plain line Aungkana a rank and rank, 2538: 120). Sample of this study were 30 forth year student teachers, in science education program, the Faculty of Education , Suan Sunandha Rajabhat University. And the retention time of 10 weeks, and to provide results intended to cover.

The research is divided into phases. The scope of the research stages below.

Stage1 Development of distance learning along the STEM fields.

Step 1: Create a learning along the STEM fields.

Step 2: Check the layout by qualified persons.

Step 3 :operations to ensure the quality management model developed learning.

Step 4 conducted an evaluation of the model curriculum developed.

Stage 2 Trial management style, learning along the STEM fields, divided into five step.

Step 1 activities Interest and identify problems.

Step 2 ideas for activities related concepts.

Step 3 three planned activities and development.

Step 4 test and evaluation activities.

Step 5 event presented the results and appreciated.

Variables

Independent Variable: The Model of learning based on STEM Education

Dependent Variable: Instructional design ability of students teachers and the critical thinking ability of students teacher

Development of learning along the STEM fields.

Phase 1 study analysis and needs assessment (Analysis: Research: R1) is intended. To study the causes and factors Affecting the development of performance-based learning. Students that promotes critical thinking skills. And to study the conditions and needs. Needed for model development and acquisition. The elements of a form of learning that promotes development, performance management, learning of students in the Faculty of Education samples. From the selection of specific actions include:

- 1) The study analyzes what to expect on the actual
- 2) The study analyzes the theory and related research
- 3) Target and desirable results of this analysis. the gap between what Expectations with reality.

Phase 2 stages of design and development of learning along the STEM fields Design and Development: Development (D1)) is a process that brings results. The first step was to define the concept. Development of And determine the composition of the Forms of learning along the STEM fields. the objective To develop the model, learning along the STEM fields. The competency-based learning. The students with the critical thinking skills of students in the Faculty of Education to determine the underlying form of learning. And modified forms of learning. The tools used to monitor and verify the validity of theoretical possibilities and consistency of the model coach. The tools were developed by reviewing literature and theoretical concepts involved through monitoring of tool. You have a number of experts from the three indices. Consistency of between 0.8 to 1.0 examiners draft model template consists of three experts comprising experts to oversee the education of one person and the professionals handle the number two man.

Phase 3 trial design. (Implementation: Research (R2)) is the leadership style of learning along the STEM fields created in step 2 with the objective to trial. To monitor performance Empirical model of learning: 1) assessment of student learning. Before and after Developed using the form 3) assess the critical thinking skills of students in the Faculty of Science Course. Design learning group learning, elementary science. Before and after Developed using a form of learning along the STEM fields 4) satisfaction of students toward. Forms of learning along the STEM fields to promoting critical thinking skills.

Phase 4 and Step evaluation. Improved form (Evaluation: Development (D2)) is the result in Step 3 as a result of. Performance analysis of formats, including performance management, learning of students. And critical thinking skills Satisfaction of students who have to use the form. The results of the analysis on the appropriate form of learning along the STEM fields to improve the model has. More appropriate And ready to be put to further use.

Tools used in Research

1. The instruments used to manage learning and lesson plans along the STEM fields that fosters critical thinking, a step-by-step process engineering design five 10th plan period of 10 weeks.
2. The tools used to collect information, including assessment of critical thinking skills. A multiple-choice answer type, select option four of the 30 items with the difficulty. between 0.38 to 0.88 The discriminative values ranged from 0.22 to 0.93 and the confidence.

Data Collection

Phase 1 stage of preparation (Preparing phase: P) consists of 1) the study of the problems and needs of developing performance management students learning 2) educating and. Training about STEM fields. And learning that promotes critical thinking.

Phase 2 planning phase (Planning phase:P): 1) planning, learning management that promotes critical thinking skills, 2) joint planning, learning along the STEM fields.

Phase 3 stage of the learning management (Coaching phase: C): 1) consultation meeting together. (Collaborative Conference) 2) observing classes each (Reciprocal Observation) 3) a review of flashback idea after observing classes (Reflection) 4) operating a self-learning (Self-directed learning) 5) a review of flashback. the idea behind self-learning performance management (Reflection).

Phase 4 stage assessment of learning along the STEM fields (Evaluating phase: E) consists of 1) an evaluation before learning along the STEM fields 2) Evaluation of the learning along. STEM fields 3) an evaluation after the 4) summary and dissemination of knowledge.

References

1. Bellanca, J. and Brandt, R.(2010). *21st Century Skills, Rethinking How Students learn*. Bloomington, IN: Solution Tree.
2. Bruce R. Joyce, Marsha Weil, Emily Calhoun.(2015). *Models of Teaching*. Ninth Edition. Pearson Education , Inc.
3. Capraro , R. M., Capraro ,M. M., & Morgan , J.R.(2013).STEM project-based learning : An integrated science, technology , engineering , and mathematics(STEM) approach.
4. Rotterdam , The Netherlands : Sense. Dechakoop, Pimpan. (2550). *Journal of learning method change Scientific Teaching Method to classroom of notion*. Bangkok : Institute of Academic Development.
5. Chairat Sutthirat. (2011). *Authentic Learning*. Bangkok : Sahamitprinting and Publishing Co. Ltd.
6. Claymier, Bob.(2014).Integrating STEM into the Elementary Curriculum, March 2014. (Message from the Children's Council President).
7. *Clemm, D. (2012.)*. Maryland State Department of Education : Science, Technology, Engineering, and Mathematics (STEM) education. Retrieved from www.Marylandpublicschools.org/MSDE/programs/stem Commission on Higher Education, Office of the Basic.
8. Education Commission (2552). Document for Primary Science Teacher the third Curriculum. Bangkok : : The Institute for the Promotion of Teaching Science and Technology.
9. Edward M. Reeve. (2013). *Implementing Science , Technology , Mathematics , and Engineering (STEM) Education in Thailand and in ASEAN*. A Report Prepared for The Institute for the Promotion of Teaching Science and Technology (IPST).
10. Marzano, Robert J. (2001). *Designing a New Taxonomy of Educational Objective*. Thousand.