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Bringing STEM Lessons into Thai Mathematics Classroom.

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Abstract. This study focuses on teaching and the learning development in mathematics through the collaborative design of technology-enhanced science lessons with STEM Education. The purposes of this research were as follows. The first purpose was to develop learning activities for the surface area and volume by organizing learning activities with STEM Education for Mathayomsuksa III students. The second was to compare achievements before and after for the surface area and volume by organizing learning activities with STEM Education for Mathayomsuksa III students. The third was to compare the ability to solve problems before and after on the surface area and volume by organizing learning activities with STEM Education for Mathayomsuksa III students. Finally, the fourth purpose was to study students' satisfaction in learning about the surface area and volume by organizing learning activities with STEM Education for Mathayomsuksa 3 students. The research samples consisted of 30 Mathayomsuksa III students at Kapong Pittayakom School, under the Jurisdiction of the Office of Region 14 Secondary Education Area. These students studied in the first semester of the academic year of 2017. 25 classrooms were acquired by a specific selection. The research instruments were: 1) a learning plan; 2) an achievement test; 3) a problem solving ability test; and 4) data that was analysed by percentage, mean, standard deviation and standard deviation. The results were as follows: 1) A plan for learning about surface area and volume for students of Mathayomsuksa III by organizing learning activities with STEM Education where efficiency was 86.31 / 89.47. 2) The learning of surface area and volume for students of Mathayomsuksa III by organizing learning activities with STEM Education had significant differences at a level of .05 after the study. 3) The ability to solve surface and volume problems for students of Mathayomsuksa III by organizing learning activities with STEM Education yielded significant differences at a level of .05 after the study. 4) The satisfaction of learning about surface area and volume for students of Mathayomsuksa III by organizing learning activities with STEM Education was observed. The learning activity was conducted based on the level of education.

1. Background

In today's world, society is changing rapidly with the advancement of technology and communication. It creates a phenomenal amount of information in a variety of sources, including the need to compete for economic advantage and to live and compete in the labor market with international civilization. So teaching 21st-century mathematics requires learners to learn with understanding, have a good

foundation in mathematics and be used to solve problems with science and technology. As for observation behavior of school students, the observation found that most students lacked the ability to solve problems. Unreasonable technology is not beneficial for quality. Mathematics is of paramount importance to the development of human thinking and allows human creativity to think in a systematic manner, to analyze problems or situations carefully and carefully, to help them make predictions, plan, solve problems and apply them in their daily life properly. Therefore, teaching mathematics focuses on the students' thinking process. Practice in systematic study with various activities. Student learning takes place while students are directly involved in those activities. The ability to investigate and have the ability to solve problems help develop advanced thinking processes. As expected that the learning process enabled students to develop mathematical achievement.

From the context of Kapong Pittayakom School. The results of the National Basic Education Testing *(*O-NET*)* of Mathayomsuksa III students at Kappong Pittayakom School Learning Mathematics in the 2016 academic year are the average score of the school is lower than the provincial, sub-national and national levels, and from observation behavior of school students. The majority of the students lacked the ability to think and solve problems without reason and they were tired of learning, were lazy and could not connect the knowledge gained from the classroom to daily use. As a result, students do not see the importance of mathematics. In addition to negative addition, students look at other subjects as far away and as a result, students in Mathematics should expect to improve.

For the reasons mentioned above. The reporter is interested in introducing the concept of learning management in accordance with the study guide to use in teaching and learning of mathematics of surface area and volume, and it is expectation is that this will help improve students' ability to solve problems as well as to develop students to full potential. It allows for a skillful person in the 21st century and brings the results of the study to the development of effective teaching and learning. Students are aware of the importance and relevance of STEM *(*Science, Technology, Engineering and mathematics*)*

Purpose of study

1. To develop a plan for learning about surface area and volume for students of Mathayomsuksa III by organizing learning activities according to the study plan.

2. To compare learning achievement on surface area and volume for students of Mathayomsuksa III by organizing learning activities according to the study plan, before and after the study.

3. To compare the ability to solve surface area and volume problems for students of Mathayomsuksa III by organizing learning activities according to the study plan, before and after the study.

4. To study students' satisfaction toward learning activities on surface area and volume for students of Mathayomsuksa 3 by organizing learning activities according to the study plan.

Conceptual Framework

This study was conducted by studying STEM Education to develop learning achievement and problem solving ability of Mathayomsuksa III students on surface area and volume. By organizing learning activities according to the study, the framework summary is as follows.
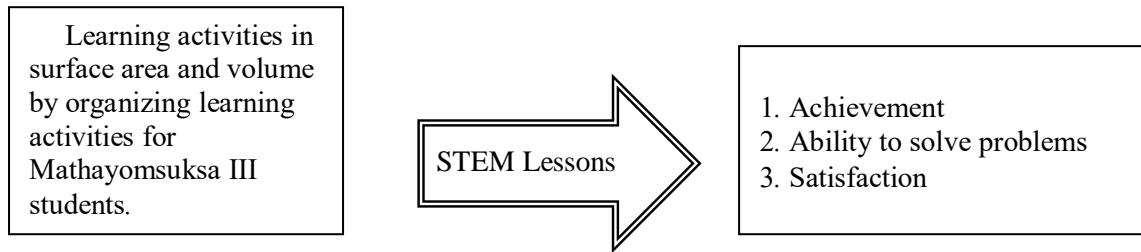
Figture 1: Research Framework

2. Method
To investigate the students' competency after learning with STEM activity in surface area and volume project for 14 hours. The methodology was employed as follows

Participants and Setting
The research participants were 25 secondary students. This purposive sampling method is to learn through STEM activity in surface area and volume and the teachers were tasked to be observers and then later reflect and discuss the method.
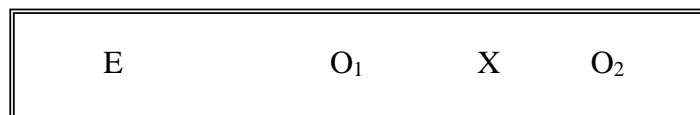
Research Instruments
The instruments used in this study included
1. A learning Plan for surface area and volume by organizing learning activities with STEM Education for Mathayomsuksa III students.
2. A learning Achievement Test on surface area and volume by organizing learning activities with STEM Education for Mathayomsuksa III students.
3. A problem solving ability Test on surface area and volume by organizing learning activities with STEM Education for Mathayomsuksa III students.
4. A student Satisfaction Assessment Form for Learning Activities about surface area and volume by organizing learning activities with STEM Education for Mathayomsuksa III students.

Data Collection
The reporter collected data in the first semester of the 2017 academic year. Data collection:
1. Experimental model this study Reporters used the One Group Pretest-Posttest Design

$$E \qquad O_1 \qquad X \qquad O_2$$

When   O1 is pre-test
         X   is learning activities with STEM Education for Mathayomsuksa III students.
         O2 is post – test
2. Data Collection Procedure
    2.1 Understand how students learn. And the role of the student.
     2.2 Pre - test the achievement test was used to measure learning activities with STEM Education for Mathayomsuksa III students, the study takes 2 hours.
    2.3 Learning activities with STEM Education for Mathayomsuksa III students.

2.4 Post - test the achievement test was used to measure and the ability to solve problems on surface area and volume by organizing learning activities with STEM Education for Mathayomsuksa III students, the study takes 2 hours.

2.5The students make a satisfaction assessment on surface area and volume by organizing learning activities with STEM Education for Mathayomsuksa III students.

Data Analysis

The researcher analyzed documents and underlying knowledge of participants in speaking and writing. Data from multiple sources such as teachers' journals and interviews;

1. Find the effectiveness of the learning plan on surface area and volume by organizing learning activities with STEM Education for Mathayomsuksa III students, by evaluating the efficiency of the process $(E1)$ and the efficiency of the result $(E2)$

2. Compare learning achievement before and after learning about surface area and volume for students of Mathayomsuksa III by organizing learning activities according to the study plan. The independent sample t-test was used at the significance level of .05.

3. Compare the ability to solve problems before and after learning about surface area and volume for students of Mathayomsuksa III by organizing learning activities according to the study plan. The independent sample t-test was used at the significance level of .05.

4. Analyze students' satisfaction level on learning about surface area and volume for students of Mathayomsuksa III by organizing learning activities according to the study plan. With average and standard deviation, the criteria for interpretation are as follows:

4.51 - 5.00 means the highest level of satisfaction.

3.51 - 4.50 means high level of satisfaction.

2.51 - 3.50 means moderate satisfaction.

1.51 - 2.50 means less satisfaction.

1.00 - 1.50 means that there is minimal satisfaction.

3. Result and Discussion

The results were as follows;

1. Plan for learning about surface area and volume for students of Mathayomsuksa III by organizing learning activities with STEM Education were efficiency is 86.31 / 89.47.

2. Learning about surface area and volume for students of Mathayomsuksa III by organizing learning activities with STEM Education. Significant differences at a level of .05 were recorded after the study

3. Ability to solve surface and volume problems for students of Mathayomsuksa III by organizing learning activities with STEM Education. After the study, significant differences at a level of .05 were observed.

4. Satisfaction of students on learning about surface area and volume for students of Mathayomsuksa III by organizing learning activities with STEM Education, the learning activities were conducted according to the level of education.

Figture 2: Student's learning activities

4. Conclusion

Based on the results, it is concluded that by using learning activities with STEM Education about surface area and volume for students of Mathayomsuksa had results. The application of knowledge in real – life situations has a positive impact. The students are learning in a fun way and are happy. There is no doubt that by solving problems and finding answers that this method is effective for both the learners and the educators.

5. Research Implication

5.1 Suggestions to use the results of the study

Before incorporating the learning activities, Teachers should have an understanding of the process of organizing, learning by the way, prepare materials / materials for students and include problem-solving planning in the event that the learning activity does not follow the plan. In order to achieve maximum efficiency in learning, the teacher should clarify understanding with students before class to help students understand their roles by giving students the freedom to think fully. The teacher is a facilitator and a guide when students encounter problems, and teachers should be flexible in their time as appropriate.

5.2 Suggestions for future research

Study the guideline of learning management in accordance with the study plan and other related subjects and can do, and to study the effect on students. In addition to learning achievements and problem solving ability the results should be explored with other variables such as creativity, critical thinking and local relevance should be incorporated in the learning activities and focus on solving real problems in the student community.

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