



# THE APPROACHES FOR IMPLEMENTING STEM (SCIENCE, TECHNOLOGY, ENGINEERING & MATHEMATICS) ACTIVITIES AMONG MIDDLE SCHOOL STUDENTS

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## INTRODUCTION

STEM Education is an interdisciplinary approach to learning that removes the traditional barriers separating the four disciplines of science, technology, engineering, and mathematics and integrates them into real-world and relevant learning experiences for students (Vasquez, Comer, & Sneider, 2013).

In this new educational idea, it is expected that students will be able to apply science, technology, engineering, and mathematics in contexts that make connections between school, community, work, and the global enterprise enabling the development of STEM literacy and with it the ability to compete in the new economy. About **Thailand's Educational Policy on STEM**, STEM education can define into two aspects. One is an instructional approach that integrates Science, Technology, Engineering and Mathematics. The other is the purpose to increase STEM workforce in the future.

## RESEARCH OBJECTIVES

This research aims to explore different approaches for implementing STEM activities that have been carried out based on the review of existing literature and experiences of middle school science teachers in Thailand. In order to accomplish these goals, the research question is "What are existing approaches for implementing STEM activities based on the review of existing literature and experiences of middle school science teachers?"

## METHOD

To answer research question, in-depth interviews used to find different ways that the teachers used for implementing STEM activities in their class. This interview result will be used to validate the result retrieved from the existing literatures based on document analysis which classifies modes of STEM implementation.

The participants in this research include **15 Science teachers** from different schools invited to take part in an in-depth interview. They are chosen purposively based on the criteria of having experience in STEM education implemented in Thailand both as participants and instructors. To know different ways for implementing STEM activities from middle school teachers, **semi-structured interviews** are used. Three main interview questions are set as follow; however, clarifying questions can be asked at any time during the interview for in-depth understanding.

- 1 Have you ever been trained to implement STEM activities in classroom? What is it like? Please describe your experience.
- 2 Have you ever implemented STEM activities in your classroom? What is it like? Please describe your experience.
- 3 In your opinions, what should be an effective approach for implementing STEM activities in classrooms?

## DATA ANALYSIS

Individual interviews are audio-recorded then transcription to get a verbatim report. Consequently, the thematic analysis is adopted. The data are thoroughly pinpointed, examined, and extracted to find patterns or themes.

### References

- Association of Thai Professionals in America and Canada (ATPAC). [2015]. Science, Technology, Engineering, and Mathematics (STEM) Education in the US and Its Translational Approaches to Thailand
- Vasquez, J., Comer, M., & Sneider, C. [2013]. STEM Lesson Essentials, Grades 3-8: Integrating Science, Technology, Engineering, and Mathematics. Washington, DC: Heinemann.

## RESULTS

According to the interview of 15 science teachers, the interview results can be classified as follows:

- The training aims at implementing STEM activities in the classroom.  
Fifteen teachers were trained for more than 2 times in the past two years. The training focused on two major forms. The first form was to provide a set of STEM activities for participants to work. According to the description of a teacher, "During the training for teachers, the facilitator raised questions and assigned the participants to compete in finding solutions, designing and working on their inventions and lastly making presentation." Another form began with introducing the science content by highlighting the practice of inquiry-based learning skill scientifically and then assigned the participants to run STEM activities. A teacher informed in the interview that "The facilitator played a role as a teacher and the participants as students to do experiments aiming at practicing their skill in inquiry-based learning and then run STEM activities in terms of designing or inventing system to facilitate in their daily life."

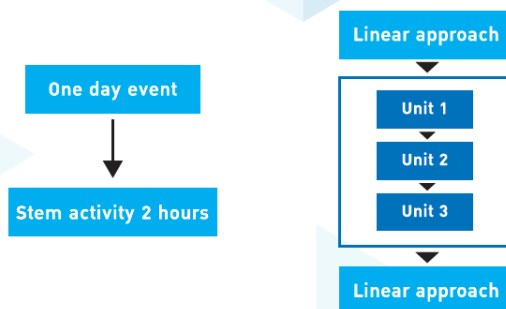
- The knowledge gained from the trainings was beneficial for the teaching in the classroom.

Targeted 15 teachers applied the knowledge gained from the trainings: STEM Activities in 3 occasions: in regular science classes; in other non-science classes, such as, the additional class, the students' gathering activity and the special sessions of reducing the study time and increasing learning duration; and lastly in a science camp. To run activities in those three occasions brought about both advantage and drawback.

- The practical guideline in applying STEM activities effectively could be concluded as following.

Almost all teachers viewed that prior to assigning the STEM activities, it was necessary for the students to have good knowledge background and competent skill in inquiry-based learning and in working as a team. The questions raised by the teacher should be familiar with students that may be related to the situations in daily life or the local wisdom. Each STEM activity should take reasonable time. The students should be encouraged to practice frequently and regularly. The problems should be developed from the easy to difficult levels respectively. At the end, the students should be able to criticize the strength and weakness of their work and their classmate's work for future improvement.

## CONCLUSION AND DISCUSSION



In Thailand, the STEM activities are implemented in the classroom in two following types:

- 1 To conduct the complete STEM activities for one time in one day – This type of implementation is easy, convenient and less time-consuming. Although the students will enjoy attending the activities, their work will not be diverse but relatively similar.
- 2 To implement the STEM activities based on the Linear Approach, it consumes time but provides good knowledge background and competent skills in learning activities' process. Their works are also diverse.