STEM Education Activities as a Way for Enhancing Students' Creative Thinking Skills

NOPHAKUN NGAEWKOODRUA
Ban Haed SukSa school,
Khon Kaen, Thailand,
email: ngnophakun@yahoo.com

INTRODUCTION

In the 21st century education, educators should equip students with skills and abilities to think critically, examine problems, and gather information, collaboration communication, creativity and innovation required for success in their future. Therefore, educational systems must transform learning objectives, academic curriculum, pedagogies, and assessment methods to help all students achieve the ultimate outcomes required for a prosperous, attractive lifestyle based on effective contributions in work and citizenship (NCREL and Metiri, 2003).

Creative thinking skills serve as the foundation to elevate levels of innovation. Individuals with creative thinking skills can effectively solve real life problems and issues encountered in this era. Students should be engaged in developing pertinent skills and strengthen their visions and determination to succeed in the 21st century. Children and youth should be encouraged to exercise their critical learning activities to increase their innovative learning abilities in various disciplines across the overall academic curriculum. Creative thinking skills are pertinent for teachers to focus on the development of students who are ready for the upcoming 21st century (Taylor and Fratto, 2012). Also a new gimmick and economic model of Thailand as "Thailand 4.0" is aimed at pulling citizens out of the middle-income trap; and focuses on a "value-based economy." Under the concept of "less for more" rather than "more for less" of Thailand 4.0 will change the country's traditional farming to smart farming, traditional SMEs to smart enterprises, and traditional services to high-value services.

Altogether, critical thinking skills developments are pertinent pedagogical tasks for teachers in the 21st century (Abdullaha and Osman, 2010). The skills serve as the key for developing the country's economy and prosperity. Teachers and students must effectively work together in ensure the skills proper developments and establishing the critical life-long learning characteristics need for success in the new era.

OBJECTIVES

The paper aimed to study each element of creative thinking skills consisting of 1) fluency, 2) flexibility, 3) originality and 4) elaboration.

METHOD

Methodology used is in accordance with the interpretive paradigm. Student's creative thinking skills development processes were closely observed, examined and interpreted. Students' learning activities were analyzed. In-depth interviews were conducted. Two STEM activities designed to enhance creative thinking skills were organized. Participants consisted of 6 students who participated in a STEM camp in Khon Kaen Province, Thailand.

Figure 1 : The students' learning team.

Figure 2 : The students' works.

RESULTS

Table 1 : Shows score of students' creative thinking skills.

Participants		Fluency	Flexibility	Originality	Elaboration	Overall(score)
Boys	1	13	9	5	10	37
	2	13	9	4	10	36
	3	15	9	4	16	44
Girls	4	16	11	5	15	47
	5	15	12	5	16	48
	6	16	12	5	15	48

CONCLUSION

The finding revealed that all participants could demonstrate their ideas on how to generate the Creative Thinking skills in all four elements. Creative thinking skills of each student expressed along the way as they participated in the two STEM activities. In addition, the participants could mention some elements of Creative thinking skills which could be generated in the STEM learning activities. This supports the results of how STEM activities running through co-operative learning and engineering process design could actually enhance students' creative thinking skills.

RECOMMENDATIONS

1. Various forms of creative activities should be included to engage all types of students personalities, learnings and strengths.
2. Designing critical pedagogy should be a team effort. It should not be a one person task to be accomplished

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