The Effects of STEAM by RST Instruction Using Writing on Elementary School Student's Problem-Solving Skills

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Abstract: Problem- solving skills are mandatory for everyone in the 21st century. The goal of STEAM also is to increase the problem-solving skill based convergence thinking. So, in this study, I proposed a study program of the STEAM by RST(Reverse Science from Technology) for improving problem-solving skills. The topics are hi-tech products which are the convergence product of Science, technology, culture and art like Refrigerators and mobile phones. This program is starting from the exciting technology and conversely learning basic science, mathematics, art and etc. That learns technology in high-tech products which were subject of curiosity, and then learn mathematics and science, which are the basis of the technology. So, learners will learn how to use basic studies to their life and it increases understanding of course content as well as the interest in learning. Also, that provides learning opportunity of Language art by utilizing writing in the learning process and learners can recognize and solve problem on their own to found and modify their thinking.

Keywords: Problem-Solving Skill, STEAM, RST, Convergence Education, Writing

Introduction

The topic of education in today's information society is the problem-solving skills. Problem-solving skills are mandatory for everyone in the 21st century by Partnership for 21st century skills, DeSeCo(Definition and Selection of Key Competencies) report of OECD, SCANS(Secretary's Commission on Achieving Necessary Skills). The complex problems in 21st century's information and knowledge-based society require problem-solving skills based convergence thinking. STEAM is also aimed at improving problem-solving skills based convergence thinking. STEAM is convergence with Science, Technology, Engineering Mathematics and Art. This study proposed a study program of the STEAM by RST(Reverse Science from Technology) using writing for improving problem-solving skills. This program is starting from the exciting technology and conversely learning basic science, mathematics, art and etc. The topics are hi-tech products which are the convergence product of Science, technology, culture and art like refrigerators, mobile phone, etc. These products are used very frequently in everyday life of learners. Furthermore, the program provides the opportunity for reflective thought by using writing in learning process. So, learners can recognize and solve the problem by themselves

1. STEAM by RST

STEAM is one of convergence study, an advanced concept of STEM. STEM is a

convergence with Science, Technology, Engineering, and Mathematics. STEAM is adding =to Art to STEM. This Art means Fine Art, Liberal Art, Language Art and so on. [Figure 1] is the STEAM Pyramid. RST is an abbreviation of the 'Reverse Science from Technology'. STEAM by RST teaches the principles of high-tech products such as mobile phones, TV, car, etc and integrated system. That increases learning interest and achievement by understanding how basic science is used in every life. Furthermore, learners can recognize the truth how to increase the value of the product by design and User Interface.

2. Problem- Solving Skills

General Problem-solving skills are procedural knowledge which is procedure and method. These can be generally applied to solve a widespread and various problems in the real world. Creative problem-solving skills refer to every kind of process that an individual or a group thinks creatively to solve a certain problem or to such efforts. These are concepts which emphasize process than outcome. So, the education for improving problem-solving skills should be focused on the process of solving the problem.

The common process of problem-solving by OECD 2004, Polya can be summarized as follows: First, understand and analyze the meaning of the problem. Second, solve the problem. Third, reflect and evaluate the ideas. So, this program was designed that learners proceed the process of problem-solving and recognize and solve the problem by themselves.

3. Writing

The process of writing is very similar to the process of solving the problem. Many subjects such as Mathematics, Science, Social Studies, Art, etc focus on these similarities and use actively the writing. Based on these previous studies, the educational effects of writing can be summarized as follows: First, writing is a tool for finding problems that is beginning of solve the problem. Second, writing provides the opportunity for reflective thinking. So, learners can be helped to solve the problem by themselves. Third, Learners are to participate actively in their learning. Fourth, Effective communication is possible by writing. So, learners can review the idea of solving problems with peers. Fifth, writing provides the opportunity to think deeply about the representation of the target. That can be useful STEAM education including art.

4. Methodology of the STEAM by RST using Writing Study Program

4.1 Directivity and select content of Study program

- Prepare standards and emphasis on STEAM by RST, writing, the process of problem-solving.
- Consider elementary school student's interest study level, learning ability.
- Choose the theme which learners can meet easily in real life
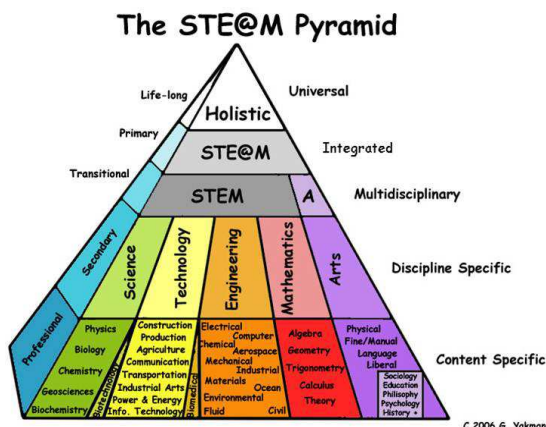
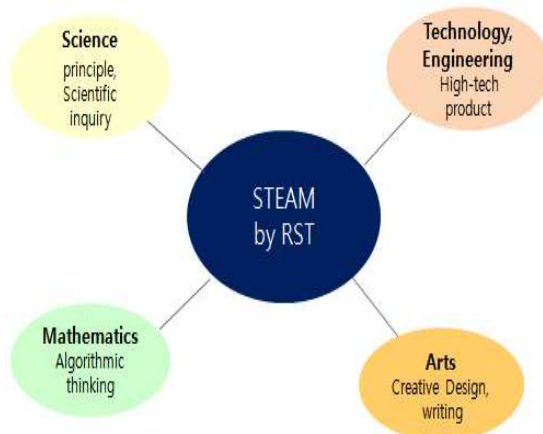*4.2 The concept model of STEAM by RST using writing*

Figure 1. STEAM Pyramid

Figure 2. Concept model of STEAM by RST using writing

4.3 Design the model for teaching

Table 1. The model for STEAM by RST using writing and content

Polya's problem solving	STEAM by RST	Writing Content
Understanding the problem	Presenting the problem	- Question and answer for Motivation
	Analyzing the problem	- Draw a picture of the subject and write the role of the component - Compare with peers and modify
Devising a plan	Devising a plan	- Write experience about the topic - Explorer and write scientific principles on the topic - Write the uncomfortable points during using the topic and writing solution
Carrying out the plan	Carrying out the plan	- Write algorithm flowchart - Discuss the scientific principles on the topic - Creative Design
Looking back	Looking back	- Presentation - Review the idea

5. Conclusion and Future Work

In this study, we developed the STEAM by RST using Writing study program to improve problem-solving of elementary school. This program could increase learning interest and problem-solving by hi-tech products. In the learning process, writing will help learner's reflective thinking. To inspect the effects this program, we have to apply this method to real class. Developed STEAM by RST program will be taught to students in class and we'll observe the student's learning activities and analyze outcomes of learning.

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