

Design the STEM theme “phone design” in fourth grade science to develop problem-solving abilities in elementary school

*Tran Khanh Trinh**

**An Giang University, Vietnam University Ho Chi Minh City*

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Abstract: *STEM is integrated into the elementary school curriculum to help children learn and have fun through the integration of theory and creative practice related to the lesson. When using STEM to teach subjects to elementary school, they will be endowed with intuitive tools and knowledge that can be promptly applied to the production of products. Science in elementary school also allows STEM-themed education to stimulate students' creativity. In this article, I discuss the application of STEM to the teaching of the topic “Phone Design” in the 4th grade Science curriculum in accordance with the 2018 general education program.*

Keywords: *STEM education, science grade 4, creativity, problem-solving.*

1. Introduction

STEM education geared towards Science and Technology 4.0 at the elementary level is a valuable asset. By employing an interdisciplinary integrated approach and fostering essential skills, it fosters a seamless fusion of subjects. Science, Technology, Engineering, and Mathematics (STEM) collectively empower students to cultivate a scientific mindset and utilize it to tackle diverse real-world challenges.

STEM education is a method of thinking about how teachers at all levels can assist students integrate information from many disciplines and encourage them to think in a more linked and holistic manner (Sneiderman, 2014).

STEM education is a paradigm of instruction that the 2018 General Education Program promotes. STEM education is an interdisciplinary approach to education derived from two of the following disciplines: science, technology, engineering, and mathematics. In mathematics, instruction methods and content learning are interconnected through the implementation of action-oriented teaching approaches (Le Xuan Quang, 2017). As a result, when STEM education is incorporated into the fourth-grade science curriculum, students are afforded opportunities to directly experience reality through knowledge-gathering and other learning activities. by applying acquired knowledge to develop scientific cognitive capacity, gain an understanding of the surrounding natural environment, and complete drawings and

products associated with each STEM theme.

2. Content

2.1. The concept of “Problem-solving capacity”

Problem solving capacity refers to an individual's ability to think about, develop, and execute solutions to issues (whether working alone or in groups). Creativity refers to the freshness of a problem-solving solution. There have been several research on the topic of problem-solving ability. Depending on each author's viewpoint and notion, problem-solving ability is a skill that students must acquire in order to succeed. Learn to face and resolve challenges that happen in life.

The Ministry of Education and Training's (2018): issue solving is the ability to solve learning challenges and discover new things to some level. To be able to solve difficulties, the subject must be in a problem scenario, figure out how to reconcile conflicts of perception or action, and devise a new solution to the problem.

There are several research on problem-solving skills. “Problem-solving capacity is the individual's ability to effectively use cognitive processes, actions and attitudes, motivation, and emotions to solve problem situations where there are no available situations, normal procedures and solutions” (Nguyen Loc, 2016). However, introducing the concept of issue solving and problem-solving ability is a creative and new approach. Because problem solving abilities are types of capacities that, in addition to addressing

cognitive and action difficulties, need learners to be able to solve problems that do not follow a preset rule.

2.2. Teaching the STEM theme according to the 2018 General Education Program

2.2.1. The STEM theme

The STEM theme is one in which knowledge is applied to solve real-world problems through the integration of engineering, technology, mathematics, and science.

STEM themes are structured according to with the technical design process or the exploration and discovery process in order to mobilize knowledge that applies science, technology, engineering, and mathematics to the solution of concrete problems in a particular context.

STEM themes in the primary school curriculum should strive to provide chances for students to use the material of a main subject in the STEM areas and associated courses to solve practical issues in accordance with the requirements. Direction for improving learners' traits and talents (Nguyễn Thi Nga, 2020).

2.2.2. Characteristics of the STEM theme

STEM subject implementation is best organized during instructional activities at school, such as group learning projects and school clubs.

STEM subjects have learning characteristics and student evaluations as the primary instructional activities in schools. In particular, the organizational plan is provided in line with the school's instructional plan.

STEM themes are created and included in the school's curriculum plan.

STEM education introduces students to scientific research procedures, and instructors may then arrange pupils to conduct suitable scientific research.

2.2.3. Science curriculum for grade four

The 4th grade Science curriculum is taught one time each week for 35 periods, divided into two semesters.

Substance: gives learners a fundamental understanding of water's qualities, applies those principles in some simple examples, shows several approaches to purify water, and draws practical connections. at home and in the community; the basic components of air, explain the causes of air pollution, and the importance of protecting clean air.

Energy: gives students fundamental understanding about the characteristics of light-transmitting or non-transmitting objects in order to explain various natural

phenomena and practical applications. Compare the loudness of sound while approaching or away from the sound source. Apply your understanding of heat transfer from hotter to colder items to explain and demonstrate how to make objects hot or cold in basic settings, as well as how to use thermometers to detect body temperature.

Plants and animals: helps pupils identify the ingredients required for the life and growth of plants. Show that plants have the capacity to generate nutrients required for survival.

Mushrooms, bacteria: assist students in identifying and describing certain features (shape, color) of mushrooms used as food by studying photographs and/or videos.

People and health: offer pupils with fundamental understanding of the categories of nutrients in food and their functions in the body.

Species and the environment: Students may use simple graphics to show how this creature serves as food for other species in nature.

2.2.4. The STEM education approach attempts to improve problem-solving skills for students.

The teaching process requires four steps (Nguyen Van Bien, 2019):

Step 1: Identify STEM theme

Select STEM subject material to examine and recommend STEM theme for students based on the following criteria: the theme name must be related with a practical product or a natural, well-known phenomena with students; compatible with the knowledge of topics that students have studied so that students may use it to explain and solve difficulties generated in the topic; the information students need to supplement is straightforward, not too difficult, and accessible to students. Means, equipment, and materials that are simple to process and make and are readily available to students.

Date, time, location, and method of topic organization that are anticipated.

Step 2: Design content to incorporate STEM themes

Create topic objectives focused on enhancing students' ability and proficiency in problem-solving and product development.

Create activities and content that align with established objectives and standards.

Step 3: Design a comprehensive plan to structure the execution of the STEM subject

Students get experience by actively engaging

in activities independently under the guidance of teachers or instructors.

Enhance students' teamwork and communication abilities by providing opportunities for them to present, discuss implementation results, and broaden topic development.

Step 4: Organize implementation and revise the plan

Implement the topic according to the plan created in step 3.

Adjust and supplement activities and plans to improve student interest based on students' discussions, debates, and feedback.

2.2.5. Illustration

Using the teaching structure of the STEM subject "Phone design" in Grade 4 Science. The instruction of the subject matter "Phone design" contains two periods and consists of the following stages:

Period 1:

Step 1: Learn what the lesson is about. In this step, teachers get their children ready to do two things:

Activity 1: Warm up and introduce the new lesson. In this activity, the teacher exposes student to: In 1667, British scientist Robert Hooke was the first to create a telephone using a wire and two butter tubes. The teacher then showed students a film on the history of phones.

Activity 2: Solutions that have been suggested. The purpose of this activity is to gather students' designs for a phone that meets the following criteria for the lesson: How can telephones be constructed to communicate with one another from a distance of 20 meters? Additionally, the phone must be constructed from eco-friendly and commonplace materials. Harmony in the color scheme of the phone is essential for aesthetic purposes.

Step 2: Plan the production of the product. For the purpose of getting ready for the following session, this stage involves organizing the work and the equipment that is required. In class, students create a phone from scratch.

Period 2:

Step 3: Students create their product. In this stage, groups utilize resources from the previous session to create a phone based on the agreed-upon strategy. Groups execute their group projects in class, while professors cover the class and assist groups as needed.

Teachers may organize a competition for students to see whose group's phone works (can communicate with each other from a distance of 20 meters). The teacher asks evaluation questions:

Why does or does not my phone function?

Should your group possess any additional materials above those that are supplied, which materials will you use? Why?

Step 4: Assess the product. Teachers collaborate with students to evaluate the group's work, which combines teacher evaluation and student self-assessment. During the assessment process, instructors carefully consider the benefits and drawbacks of students' goods. Students not only learn about the product design process, but they also learn from mistakes and insufficient information.

3. Conclusion

Developing learner capacity is one of the teaching orientations consistent with the 2018 general education program that includes the implementation of STEM education in elementary institutions. Every educator must implement a method of flexibly organizing STEM topics and lessons, taking into account the lesson's content and the physical conditions of each school, in order to foster an engaging learning environment that not only cultivates learners' general qualities and skills but also stimulates their creativity in order to develop subject-specific capabilities.

The article applies the principles and attributes of STEM education, including problem-solving abilities, to the instruction of the subject matter "Phone design". STEM-focused instructional activities for fourth grade Science will aid students in mastering the lesson, cultivating their learning and practical product manufacturing skills, and most significantly.

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