

Vận dụng dạy học dự án trong môn Khoa học lớp 4

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TÓM TẮT

Môn Khoa học ở tiểu học không chỉ hình thành cho học sinh các năng lực đặc thù mà còn góp phần hoàn thiện các phẩm chất và năng lực chung. Vì vậy, dạy học dự án (DHDA) đúng quy trình là một trong những phương pháp dạy học phù hợp. Chương trình môn Khoa học ở tiểu học nói chung và Khoa học lớp 4 nói riêng chủ yếu gồm các kiến thức thuộc lĩnh vực khoa học tự nhiên như lý học, hóa học và sinh học nên sẽ giúp rèn luyện các năng lực một cách hiệu quả thông qua thực hiện các dự án học tập trong một số bài học. Đồng thời, để hoàn thành dự án học tập, cần có sự tham gia của nhiều người, mỗi người cần kiên trì, trung thực, có trách nhiệm và phối hợp nhịp nhàng từ lúc bắt đầu đến lúc tạo ra sản phẩm của dự án nên góp phần hình thành các năng lực tự chủ và tự học, giao tiếp và hợp tác, giải quyết vấn đề và sáng tạo cho học sinh, đáp ứng mục tiêu của chương trình giáo dục phổ thông mới.

Từ khóa: Dạy học dự án, khoa học lớp 4, tiểu học.

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Application of project-based learning in science class Grade 4

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ABSTRACT

Science not only helps students develop specific competencies but also contributes to the enhancement of general qualities and abilities at primary schools. Therefore, implementing project-based learning (PBL) in proper ways is one of the appropriate teaching methods. The primary Science curriculum in general, and Grade 4 Science in particular, mainly consists of knowledge from natural sciences such as physics, chemistry, and biology. This makes it useful for fostering students' competencies by incorporating learning projects into several lessons. At the same time, the involvement of several people is necessary for successful completion of the project. Each participant needs to exhibit perseverance, honesty, responsibility, and efficient coordination from the initial planning process to the final result. Consequently, PBL strengthens students' essential competencies with self-regulation and independent learning, communication, teamwork, problem-solving, and innovation, all of which are in line with the objectives of the new general education curriculum.

Keywords: *Project-based learning (PBL); Grade 4 science; Primary education.*

1. INTRODUCTION

The new general education curriculum is designed with a competency-based approach. Competency is characterized as the effective integration of knowledge, skills, behaviors, and attitudes within learners. To advance a comprehensive growth of students' competencies, it is essential to cultivate the three primary competencies: self-regulation and independent learning, communication and teamwork, and problem-solving and creativity across all courses. Additionally, depending on each subject and educational level, specific competencies such as linguistic competency, mathematical competency, scientific and social

inquiry competency, digital literacy, physical competency, and technological competency should be systematically and methodically developed. These efforts aim to nurture five key qualities of patriotism, compassion, diligence, integrity, and responsibility as outlined in the curriculum's objectives.

To foster the necessary competencies and virtues in students, the curriculum is organized with lessons structured around four key activities namely engagement, exploration, practice, and application. Throughout these activities, educators are urged to implement teaching strategies that actively engage students

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in the learning process, one particularly effective approach is project-based learning (PBL), which helps the competency-based framework in a meaningful and practical manner.

Project-based learning (PBL) was developed by American educator and philosopher John Dewey from 1859 to 1952 and originated in the disciplines of medicine and education. Dewey advocated for teaching pupils learning processes through the establishment of specific projects and the selection of appropriate solutions to attain successful outcomes.¹ This approach was first implemented by Howard Barrows, an American professor of neurology at McMaster University (Canada) in 1969.^{1,2} Since the late 16th century, the concept of "Project" has been used in Italian architectural schools and subsequently implemented in several universities in France, the United States, and other European countries. In the early twentieth century, American educators laid the theoretical foundation for the Project Method, recognizing it as a student-centered teaching style that promotes the development of numerous competencies at various educational levels.³

The Science subject at the primary level encompasses six main themes of Matter, Energy, Plants and Animals, Fungi and Bacteria, Humans and Health, and Organisms and the Environment.⁴ This subject integrates fundamental knowledge from various natural sciences, including physics, chemistry, and biology - inherently experimental disciplines. Therefore, implementing PBL in lesson activities, particularly in the application phase, is essential for fostering students' qualities and competencies. Given this context, we recognize the necessity of researching *"Project-Based Learning in Grade 4 Science Education."*

2. MAIN CONTENT

2.1. The role of project-based learning in science

A project is a type of research that is carried out to be applied practically to accomplish particular

economic and social outcomes. It is highly application-oriented and operates within defined constraints of time and resources.

Project-based learning (PBL) is a teaching method in which students engage in complex learning projects that combine theoretical knowledge with practical application, resulting in concrete outcomes that can be presented. These assignments necessitate a high degree of student autonomy and are carried out under the supervision of teachers. Throughout addressing real-life situations or scenarios linked with the curriculum, students acquire knowledge and develop critical skills by integrating theory with hands-on practice. Group work is the primary modality of instruction in this approach.^{5,6}

Project-based learning (PBL) is an activity that calls for the participation of a large number of students who must think independently to determine the way to do the project, work well with others during its implementation, and especially be creative in order to create finished products. Therefore, students develop self-control and self-directed learning, communication, and collaboration, as well as problem-solving and creativity through PBL. This is considered as a foundation that fosters qualities such as diligence, honesty, and responsibility. Moreover, creating useful goods for the environment, community, and society demonstrates traits like patriotism and compassion.

As a result, PBL not only helps students accomplish subject-specific abilities but also comprehensively builds the vital qualities and competencies that match with the objectives of the new general education curriculum.

2.2. Project-based learning process

A learning project can be implemented using the following steps:³

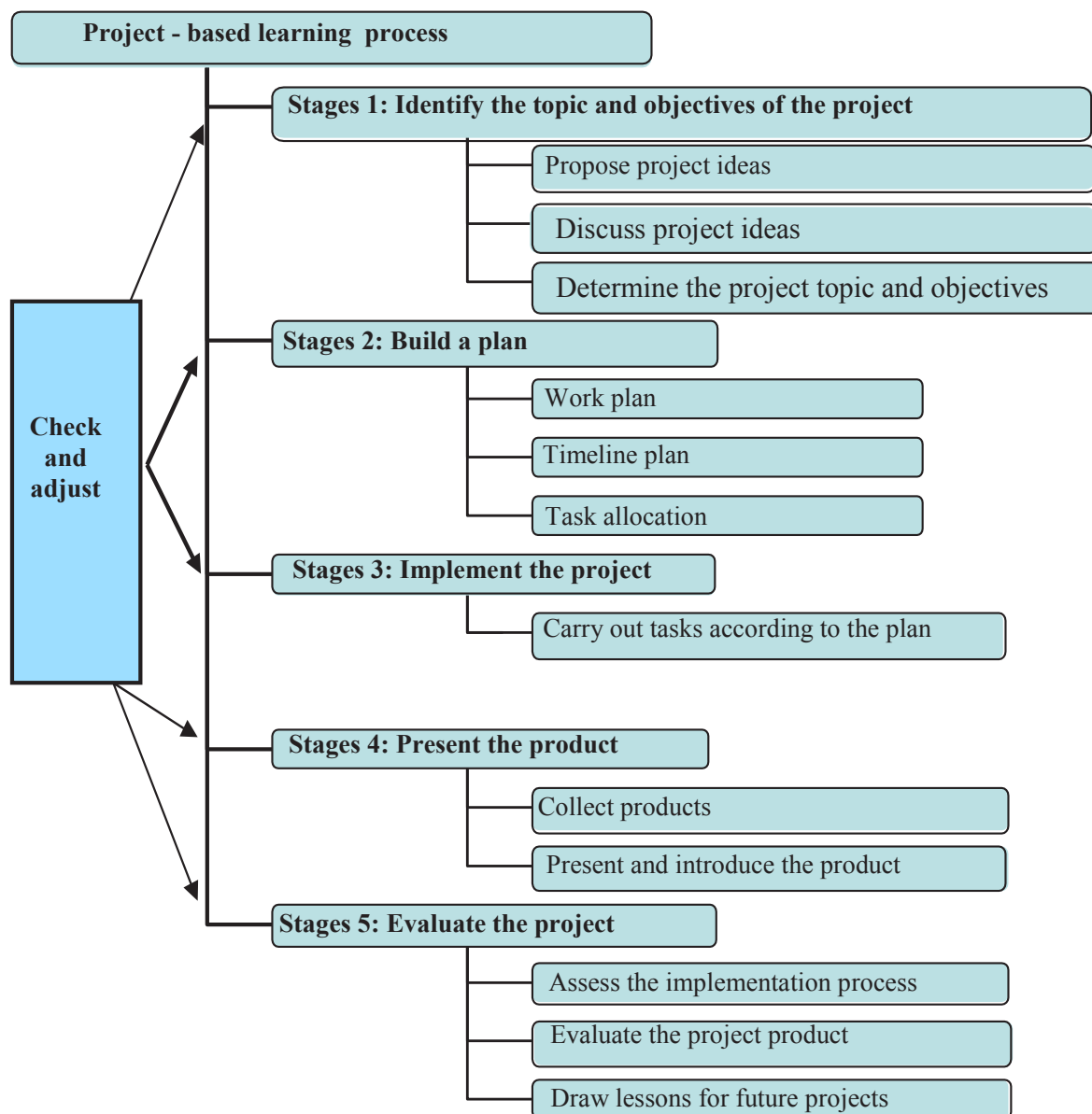


Figure 1. Project-based learning process.³

For primary school children, their ability to work independently is still growing. As a result, teacher assistance is required for stages 1 and 2 to ensure PBL efficacy.

2.3. System of lessons/project-based learning (PBL) activities in grade 4 science

The new general education curriculum is implemented through three parallel sets of textbooks: Kite wing, Connecting knowledge

with life, and Creative horizons. While each set differs in presentation and design, they all adhere to the standardized content framework established by the Ministry of Education and Training. Therefore, this study focuses on organizing lessons and activities suitable for PBL using the Kite wing textbook series as an illustrative example (refer to Table 1), with the same methodology applied to the other textbook sets.

Table 1. System of lessons/project-based learning (PBL) activities in grade 4 science.
Kite wing Textbook Series.

(Inclusion of six themes with 23 knowledge-providing lessons and six review lessons)

Theme	Lesson title	PBL activities
MATTER	Lesson 3. Protecting water resources and Methods of Water Purification (2 periods)	Project: Designing a water filtration system
ENERGY	Lesson 7. Light transmission (2 periods) Lesson 10. Sound in daily life (2 periods) Review of the energy theme (1 period)	Project: Building a mini movie theater Creating a simple sound-producing device Planting trees in the schoolyard to reduce noise pollution
PLANTS AND ANIMALS	Review of the plants and animals theme (1 period)	Producing fermented products to understand the role of beneficial bacteria (e.g., yogurt, pickled vegetables)
FUNGI AND BACTERIA	Review of the fungi theme (1 period)	Creating a collection of beneficial fungi
HUMANS AND HEALTH	Lesson 18. Nutrition and diet (4 periods) Review of the humans and health theme (1 period)	Designing a one-week meal plan for yourself and family Designing a meal plan for friends in cases of nutritional imbalance
ORGANISMS AND THE ENVIRONMENT	Review of the Organisms and environment Theme (1 period)	Creating a model of the food chain and food web

Overall, in the new general education curriculum, a Science lesson is structured around four core activities: Engagement, exploration, practice, and application. PBL is most effective when employed during the practice or application phases, allowing students to reinforce their knowledge and apply it in real-life situations. Furthermore, each lesson includes two to three periods in the new curriculum. While the theory is taught in the first period, the others are used for practical activities and application. Thus, there is enough time to conduct PBL.

2.4. Experimental implementation of project-based learning (PBL) activities

Topic: Energy

Lesson 10. Sound in daily life (2 periods)

Application Activity:

- Objectives: Developing a sound-producing device.
- Implementation steps:
 - + Step 1: Define the project theme and objectives
 - Make a sound-producing device in daily life.
 - Divide the class into four groups. Each group discusses how to make a sound-producing device out of recycled materials, transforming waste into usable products (for example, children's toys, etc.).

+ Step 2: Develop a plan

Each group chooses the product they will make, plans the process, and allocates members' duties to obtain the necessary materials. A representative from each group presents their idea to the class to ensure diversity and avoid duplication of projects.

+ Step 3: Execute the project

During the second period of the lesson, students prepare all materials and carry out their projects according to the plan agreed upon in the first period.

Group 1: Create a drum using an aluminum can. The can is cut open, with plastic film used for the drumhead and a bamboo stick as the drumstick.

Group 2: Build a guitar with foam or cardboard and metal wires. The foam or cardboard is cut to the shape of a guitar, with wires serving as strings.

Group 3: Craft a flute from bamboo tubes.

Group 4: Build a lithophone (stone musical instrument).

+ Step 4: Present the products

Each group displays their tools, explains the production process, and shows how their product produces sound. From there students consolidate their understanding that *sound is produced by the vibration of objects*.

+ Step 5: Evaluate the Project

Students and the teacher assess each group's work, with emphasis on the construction process, finished result, and capacity to describe and analyze sound generation via vibrations.

Recognition and rewards are provided, followed by contemplation on how to improve future classes.

Conclusion: During the above application phase, students learn following crucial competencies and qualities:

- Autonomy and self-learning competence: independently designing and executing their projects, etc.

- Communication and collaboration competence: group discussions, material collection, and task delegation etc.

- Problem-solving and creativity competence: innovating and explaining their creations and results etc.

- Students need to be hard-working, careful, and self-aware in order to produce the items listed above etc. which promote important character attributes such as diligence, honesty, and accountability. Students also cultivate an awareness of environmental protection, fostering a sense of national pride through sustainable actions.

Topic: Organisms and the environment

Review lesson on Organisms and the environment (1 period)

- Objectives: Apply knowledge to better comprehend the relationships between creatures in their habitats; raise awareness about the need of animal protection and conservation in their natural environments.

- Implementation steps:

+ Step 1: Define the project theme and objectives: Practice producing food chains and webs.

+ Step 2: Develop a plan

Separate the students into four groups, each of which have to develop a natural food chain and web.

Each group discusses their idea, decides on their approach, and assigns duties to collect the necessary supplies.

Representatives from each group present their ideas to the class to promote diversity and avoid duplication.

+ Step 3: Execute the project

Groups work on their projects according to the agreed-upon plan.

Group 1 uses foam models, drawings, or printed images from the internet or newspapers to depict terrestrial food chains and food webs.

Group 2 illustrates aquatic food chains and webs with similar materials.

Group 3 represents local food chains and food webs in their surroundings.

Group 4 demonstrates wildlife food chains and food webs.

+ Step 4: Present the products

Groups present their procedures and explain the concepts of food chains and webs. Students emphasize the importance of plants in life and encourage their families to maintain ecological balance to contribute to environmental protection.

+ Step 5: Evaluate the project

Students and teachers evaluate each group's work based on method, product, and capacity to communicate the ecological relevance of creatures.

Compliments are offered, followed by suggestions for improving future lessons.

Conclusion: The adoption of PBL in the review lesson on Organisms and the environment encouraged students' abilities and competencies:

- Independence and autonomous learning competence: independently conceptualizing and executing projects aligned with the lesson objectives

- Interaction and cooperation competence: engaging in discussions, planning methods, and giving tasks for collecting or crafting visual representations of organisms using materials such as foam etc.

- Resolving issues and creativity competence: creating food chains and webs, which are required, and describing both the stages and the outcomes, etc.

Students must try to think creatively about food chains, gather pictures or specimens,

and arrange them into the proper food chains and webs in order to accomplish the project. Moreover, by explaining these food chains and webs, students learn more about the significance of natural species and their habitats relationships. This approach helps students form their essential qualities, including patriotism, compassion, diligence, honesty, and responsibility, as indicated in the new general education curriculum's objectives.

The two preceding PBL activities were implemented in two types of lessons: one focusing on teaching new knowledge and one serving as a review at the end of a topic. With PBL process indicated in Table 1, teachers can choose relevant teaching to improve lesson efficacy and student engagement while also enhancing students' learning experiences.

Employing these results and the content standards showed in Table 1, teachers can develop and execute acceptable learning projects across a range of subjects, lessons, and instructional activities, notably at the primary education level and also in other educational stages.

3. CONCLUSION

Project-based learning in Grade 4 science is one of active teaching approaches that is suitable for certain subject content and contributes to achieving the goals of the new general education curriculum: the comprehensive development of five core virtues - patriotism, compassion, diligence, integrity, and responsibility - while encouraging three key competencies: self-regulation and self-directed learning, communication and collaboration, and problem-solving and creativity. Additionally, PBL helps students develop subject-specific competencies, including scientific reasoning, environmental inquiry, and acquired knowledge and skills application in practical contexts.

In Grade 4 science, PBL can be implemented in both lessons introducing new knowledge and review sessions. The structure of the new general education curriculum,

particularly the science curriculum, is well-suited for PBL, as each lesson includes hands-on practice and application activities and spans 2–3 class periods, enhancing the quality of instruction while fostering a stronger connection between classroom learning and real-life experiences.

It is necessary for Grade 5 Science and other subjects to be continuously researched and conducted by PBL. However, teachers need to invest in preparing lessons, motivate and encourage students, and receive professional and material support from leaders at all levels.

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