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Using the project method in teaching math for primary school students

Doan Thi My Linh
Thu Dau Mot University, Vietnam

* Corresponding Author: **Doan Thi My Linh**

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Abstract
Teaching mathematics is one of the important intellectual educational tasks for elementary school students to meet the requirements of the modern social context. The mathematical ability of elementary school students is demonstrated through thinking, logical reasoning, and knowing how to use mathematics to solve problems. There are many measures to teach mathematics for elementary school students, in which the application of active teaching methods in teaching is one of the measures that is of great interest. Research some theoretical issues about project method and the mathematical abilities needed by elementary school students. This article proposes a process for applying the project method in organizing math teaching for elementary school students. The proposed process includes 3 stages: Stage 1 teachers identify and organize the project goals for students, stage 2 teachers organize students to carry out the project. Through the teacher's teaching organization, students identify project implementation tasks and apply learned knowledge to solve problems in daily life. In phase 3, teachers organize assessment activities. evaluate student learning outcomes. Applying the project method to organizing mathematics teaching for elementary school students has positive significance in promoting students' positivity in learning and developing mathematical capacity in accordance with the context of integration.

Keywords: Project Method, Teaching mathematics, elementary school students

1. Introduction

In the context of integration, people need to have a lot of capacity to adapt in the context of developed society. People need to have a lot of capacity to adapt in the context of social development. One of the necessary abilities is Thinking capacity and reason logically. The four pillars of education in the twentieth century were proposed by UNESCO, which are essentially life skills approaches that have been thoroughly grasped in innovating the goals, content and methods of general education in Vietnam (UNESSCO, 2015) [12]. To achieve this goal, teachers must research and apply active teaching methods to organize the educational process so that learners can participate in diverse and rich types of practical activities, from That way, students can form the necessary abilities. Project teaching is an active teaching method that encourages students to explore and realize the knowledge they have learned during the implementation process and create their own products. Therefore, project teaching is very suitable to apply to the organization of the capacity education process for elementary school students. However, applying the project method to organizing teaching in elementary schools also has certain limitations and difficulties, so it is necessary to choose the appropriate project and organization to achieve effectiveness in teaching mathematics.

The article presents some theoretical issues about Kilpatrick's project method, the characteristics and processes of the project method and its application to teaching mathematics for elementary school students with a specific project to help students learn simple, logical thinking and use mathematics to solve everyday problems suitable for ages.

2. Research content and results

2.1. History of researching the problem

The project method, proposed by author William Heard Kilpatrick in 1918, engages students in purposeful activities designed

to help them learn new skills and knowledge. Kilpatrick argues that traditional teaching methods, which rely on lectures and memorization, are ineffective in helping students develop critical thinking skills and problem-solving abilities. Instead, he suggests that educators should focus on creating projects that allow students to work collaboratively and solve real-world problems (Kilpatrick, 1918) [4]. In the first studies on the project method, in 1920 James Leroy Stockton listed a number of areas where the project method could be applied to teaching (Stockton, 1920) [9]. However, he did not provide specific examples. In 1921, Stevenson. R.W provided many examples of projects for teaching numerical subjects such as Geography and Biology (Nguyen Thi Viet Ha, 2016) [8]. In 2000 John W. Thomas offers 5 assessment elements have been synthesized: assessment of knowledge gained (academic achievement); Evaluate learners' problem-solving strategies during project implementation (problem-solving strategies); Assessment is based on measures of mathematical reasoning; Skill assessment is based on performance tasks and assessment is based on observation, self-assessment of learner feedback (participants self-report for assessment in 2003, Thorm Markham proposed stages: Project idea generation stage; Technical implementation phase, asking guiding questions, Plan evaluation phase; Project plan implementation phase. Project implementation process but the way of dividing the stages is different. Depending on the scale of application, the stages can be divided into stages. Small steps are oriented towards the technical process (Nguyen Thi Viet Ha, 2016) [8]. In 2011, Steve Pickering uses R.A.F.T to evaluate products. R.A.F.T is a teaching strategy used by many teachers, in which learners are given a number of topics (T – Topics) to choose from, then choose the role (R – Role) that they will participate in as individual/group (similar to choosing a role), then the learner must choose the audience (A - Audience) related to his or her role. Finally, choose the format (F- Format) to demonstrate the product. The project method brings many positive benefits to learners. However, using this method in teaching also faces some difficulties. In 2011 Luis Roberto defined the muscle challenges in the following version: (1) Time, projects require more time to plan and execute than regular classroom lessons ; (2) Classroom management, in which the most difficult thing is to ensure human autonomy and self-management of learning and classroom order; (3) Depth of topic and related subject content. (4) Questions are strictly oriented but very difficult to control with learning activities (Nguyen Thi Viet Ha, 2016) [8].

In Vietnam, the Ministry of Education and Training has applied the project method to teaching since 2003. The program was piloted in 20 schools in 9 provinces and cities across the country. This program aims to improve the quality of education in fields such as math, science and technology, helping students develop higher-level thinking skills (Nguyen Thi Viet Ha, 2016) [8]. Educational researchers have had many different research topics on project-based teaching methods such as author Nguyen Van Cuong researches on general issues of project method and application of project method in general education. Author team Trinh Van Bieu, Phan Dong Chau Thuy, Trinh Le Hong Phuong researched and applied the project method to help students apply theory into practice (Trinh Van Bieu *et al*, 2011).

2.2. Project methodology theory

The project method proposed by Kilpatrick is based on a learning theory approach originating from psychological thinking, according to the connectionist perspective of Edward L. Thorndike. Horndike states that feedback behaviors performed based on satisfaction will easily be repeated in similar situations, such as an employee coming to work early and being praised by their superiors, this behavior can This situation will probably repeat itself many times. Conversely, if the behavior leads to insecurity, the discomfort will become weaker and the behavioral response will be less likely to occur when the situation is repeated. In the teaching process, Kilpatrick believes that learning is the development of an individual's awareness and skills in learning. An individual's learning is a process based on stimulation and response, in which the response created by the stimulus changes the nervous system to form awareness and acting on that awareness, skills will be formed wall. In a given situation, stimuli cause reactions that create associations and appear different connections in the nervous system, this is the individual learning process (Kilpatrick, 1918, 1926; Beineke, 1998) [4, 5].

According to Kilpatrick (1926) [5], learners participating in a certain situation will have many different ways of behaving because he believed that individual behavior depends on satisfying their needs. If the stimuli create satisfaction or frustration, the learner's response will be associated with their behavior. From there, he argued that individuals' intellectual abilities play a role in directing their activities toward goals to achieve those satisfactions. Individual behavior is guided by the ultimate goal, creating the satisfaction of individual needs, thereby producing the learning process (Kilpatrick, 1918) [4].

Kilpatrick believes that learning motivation is connected to an individual's willingness to consciously try to act to achieve the goals that he has set for himself. From there, the learning process begins with goals for the activities, then research and thinking about ways to achieve the goals, then personal practical activities and creating personal satisfaction with the work. achieve set goals, thereby allowing learning to take place (Kilpatrick, 1918, 1926; Beineke, 1998) [4].

From the perspective of students' psychological developments during the learning process, Kilpatrick proposed a theory of the project method consisting of 4 different steps. Identifying goals to motivate students to participate in a project and be ready to achieve a certain goal through their activities, consciously planning individual activities, activities to achieve If the goal is achievable, evaluate the satisfaction with the achieved results. Kilpatrick believes that a learning activity cannot be motivated if students do not know what the object of motivation is. Planning and carrying out an activity is also impossible without a conscious goal that the student is aiming for. If students wish to evaluate something, they must have a reference point for what is being evaluated, i.e. a goal set for the activity. If students act to achieve the goals set according to Kilpatrick, it is called learning (Kilpatrick, 1918) [4].

An example of motivated learning connected to a process in which students create a kite is presented according to Kilpatrick's project method theory: - Stage 1: Identifying the goal of manufacturing a kite and make it fly; - Phase 2: Plan how to properly build a kite, what knowledge and skills are required and how to make the kite fly; - Stage 3: Think about the characteristics of the kite and find ways to achieve your desires. Students take action in ways they can find to make the kite fly and create satisfaction in the student; - Stage 4:

Evaluate the results of the kite making process described as the learning process that takes place.

2.3. Project method in teaching

2.3.1 Concept of project method in the classroom

According to Michael Knoll, Kilpatrick's project method focuses on the learning process of students. Therefore, teachers' teaching activities are still unclear in this method. The main idea in the project method is the mental and cognitive development of students, so the problem is how teachers must organize teaching activities so that the learning process takes place according to the project method. has not been clarified (Campbell, 1995) [2]. However, Kilpatrick (1918) [4] believes that the teacher's role is to support the learning process of students' own cognitive development, meaning the teacher is a direct or indirect guide for students to develop their awareness. The teacher's task is to create events that motivate students to participate in the learning process and achieve set goals (Kilpatrick, 1918, 1926; Beineke, 1998; Tenenbaum, 1951) [4].

From the perspective of learning and the role of teachers when using the project method, the author can draw the concept of the project method in teaching: "The project method in teaching is a teaching method. learning in which students perform a complex learning task, combining theory and practice to create products" (Nguyen Huu Hop, 2018) [7].

2.3.2 Characteristics of project method in teaching organization

When using the project method, teachers need to be able to evaluate the situation of students and provide a motivating task for students to actively perform and develop awareness, which is a project (Kilpatrick, 1918, 1926; Beineke, 1998; Tenenbaum, 1951) [4]. In addition to evaluating individual students, teachers must also be able to evaluate society to create situations and projects suitable to educational goals. Therefore, the teacher's task is to evaluate the applicability of projects to ethical social life and democracy, but in a way that the teacher's teaching activities correspond to the needs set for the project. , that is, of the student's genuine interest in the task proposed by the teacher (Kilpatrick, 1918; Tenenbaum, 1951) [4]. A special problem teachers face is how to maintain students' interest in a project for as long as possible and purposefully (Kilpatrick, 1918) [4].

From there, we can draw the following characteristics of the project method in organizing educational activities:

Practical orientation: the project's topic comes from situations of social reality, professional practice as well as real life. Project tasks need to contain issues appropriate to the level and cognitive ability of the learner. Learning projects have practical social significance, contributing to linking learning in school with real life and society. Under ideal circumstances, implementing projects can have positive social impacts.

Orienting learners' interests: Students can participate in choosing topics and learning content suitable to their personal abilities and interests. In addition, the learner's interest needs to continue to develop during the project implementation process.

Complex and interdisciplinary: project content combines knowledge from many fields or different subjects to solve a complex task or problem.

Action orientation: during project implementation, there is a combination of theoretical research and application of theory into practical activities and practices. Through that, test, consolidate, and expand theoretical understanding as well as practice action skills and practical experiences of learners.

Learner self-reliance: in project-based teaching, learners need to actively participate and be self-reliant in all stages of the teaching process. That also requires and encourages learners' responsibility and creativity. Teachers mainly play the role of consultant, guide, and helper. However, the level of self-reliance needs to be appropriate to the student's experience, ability, and difficulty level of the task.

Collaborative work: learning projects are often carried out in groups, including collaborative work and division of work among group members. Project-based teaching requires and trains readiness and working skills among participants, between students and teachers as well as with other social forces participating in the project. This characteristic is also known as social learning.

Product orientation: during project implementation, the products created are not limited to theoretical gains, but in most cases learning projects create physical products of practical and hands-on activities. These products can be used, announced, and introduced.

2.3.3. Applying the project method in math teaching

Based on the cognitive development process of students according to Kilpatrick's project method theory, it takes place in 4 steps: determining goals, planning, implementing plans to achieve goals, evaluating results personal satisfaction compared to the goals to be achieved; Based on the role of teachers in organizing the teaching process so that students can develop according to the steps of project method theory; Based on the characteristics of the project method in organizing teaching, the study proposes the process of organizing math teaching according to the project method as follows:

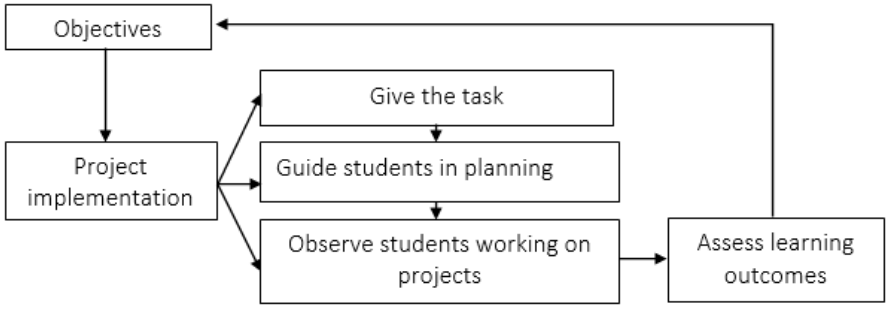

Fig 1: Process of organizing math teaching according to the project method

Figure 1 shows the process of organizing educational activities based on the project method including 3 main Stages as follows:

Stage 1: Identify goals: Organize group discussions for students to determine the goals to be achieved from assigned tasks.

Stage 2: Implement the project: In this Stage , teachers perform 3 steps as follows:

Step 1: Teacher assigns tasks to students. Based on the characteristics of the project and the objectives of the lesson, create tasks that match the experience and interests of students, in accordance with technical means and the allowed time budget. It is possible to propose a number of different ideas from real social situations, it is necessary to create a situation with a problem or task that needs to be solved (Nguyen Huu Hop, 2018) [7].

Step 2: The teacher guides students to develop a plan: determine what needs to be done to achieve the goal of the task and to perform the identified tasks, find out what knowledge is needed , skills to perform tasks and achieve set goals.

Step 3: Observe students implementing the project, students apply theory to perform the proposed tasks from which the project products are created. Project products can be reports, articles or physical products. Based on the results of the task, students can draw knowledge, skills and experience to be able to complete the task better.

Phase 3: Evaluate the product: Based on the product students have made, analyze the advantages and limitations in the process of applying theory to product implementation, so the product has good points and bad points. for students to perfect the knowledge system and skills they gain.

2.4. Applying the project method in teaching mathematics for elementary school students

2.4.1. Theory of teaching mathematics for elementary school students

Objective: Students have initial basic mathematical knowledge and skills in arithmetic, common quantities and measurement, and some simple geometry, know how to calculate, estimate, and use mathematical language in learning and solving simple and familiar problems in daily life (Ministry of Education and Training, 2018).

Content of Mathematics in elementary school: Based on the 2018 general education program, the content of mathematics in elementary school includes three main contents including Numbers and Algebra; Geometry and Measurement; Statistics and Probability and has a structure based on a combination of both a linear structure and an expanding and gradually improving structure (Ministry of Education and Training, 2018).

Numbers and Algebra are the basis for all further research in Mathematics, with the aim of forming mathematical tools to solve problems in Mathematics and other related scientific fields as well as gain practical skills needed for everyday life. Functions are also important tools for building mathematical models of real-world processes and phenomena. An important goal of learning Numbers and Algebra is to give students the ability to reason deductively, contributing to the development of logical thinking, mathematical creativity and the formation of the ability to use algorithms. (Ministry of Education and Training, 2018).

Geometry and Measurement are one of the most important components of Mathematics, essential for the acquisition of specific spatial knowledge and essential practical skills. Geometry forms tools to describe objects and entities of the surrounding world. An important goal of learning Geometry is to give students the ability to reason and perform mathematical proofs, contributing to the development of logical thinking, mathematical creativity, and imagination time and intuition. In addition, Geometry also contributes to aesthetic education and improving mathematical culture for students. Combining Measurement and Geometry will enhance the intuitiveness and practicality of teaching Mathematics (Ministry of Education and Training, 2018).

Statistics and Probability are a mandatory component of Mathematics, contributing to enhancing the applicability and practical value of mathematics education. Statistics and Probability give students the ability to perceive and analyze information presented in many different forms, understand the probabilistic nature of many dependencies in reality, and form an understanding of the role of statistics. The role of statistics as an important source of information in society, knowing how to apply statistical thinking to analyze data. From there, improve understanding and research methods of the modern world for students (Ministry of Education and Training, 2018).

2.4.2. Applying the project method to teaching Mathematics for elementary school students

The project was carried out during practice hours on the topic "Angles and units of angle measurement". “Some units of quantity measurement”, “Perpendicular lines and parallel lines” Grade 4 Math (Ha Huy Khoai *et al*., 2022) [3].

Name of the project "Classroom decoration"

Competencies to be achieved: Carry out simple thinking operations on problems in life such as decorating the classroom, Use mathematics to solve familiar problems in life such as quantity and appropriate materials for classroom decoration.

Applying the project method to teach Mathematics for elementary school students with the project "Classroom Decoration" we implemented in a 3-phase process with specific activities as follows:

Table 1

Process	Activities of teachers	Student activities	Transformational purpose
Objectives	- Use a protractor to measure angles: 60º, 90º, 120º, 180º - Recognize two parallel lines. - Convert units of measurement and time in real-life situations - Use the knowledge you have learned to apply it in practice, explore, discover and solve tasks in life.	Discuss in groups and figure out the tasks to be done.	Perform simple thinking operations about problems in life
Project	Give the task	Students listen to the task	Perform simple thinking operations

implementation	Grouping: Divide the class into groups to perform assigned tasks together. Task: Students should determine the area of the room, the corners of the classroom, determine the materials and ways to decorate the room and present the quantity and materials needed to decorate the classroom.	and determine what work needs to be done to perform the task	about problems in life
	Guide students to develop plans Identify necessary knowledge and skills: -Knowledge of how to use measuring tools, formulas for calculating area, and parallel lines. - Use mathematical formulas to determine the amount of materials needed to decorate the classroom - Plan each task until the classroom decoration is completed.	Group discussion determines the order of each task Assign members to perform each job in accordance with each individual's capacity. Plan work execution.	Using mathematics to solve problems related to life is the appropriate quantity and materials to decorate the classroom. Convert units of measure and time in real-life situations
	Create conditions for each member to do their work. If any member has any difficulty, please contact the teacher for help.	Each member performs his or her work according to the prescribed time limit.	- Use a protractor to measure angles: 60^o, 90^o, 120^o, 180^o - Recognize two parallel lines.
Assess learning outcomes	Presenting products and presenting classroom decoration plans. How to decorate the classroom? The product of the project is a decorated classroom	The group displays products and sends a group representative to present the products.	Using mathematics to solve problems related to life

3. Conclusion

Research shows that applying the project method to teaching Mathematics has a positive significance in developing mathematical capacity for elementary school students. Teaching activities using the project method can be carried out outside the classroom environment, changing the learning environment and increasing students' interest in learning. Project methods are often organized around group work, students learn to work like researchers, with labor tools that form the ability to collaborate and innovate through the labor process of creating products. Students have the opportunity to present their work, so they develop presentation skills and the ability to analyze the value of the product. However, every teaching method has advantages and disadvantages; In new research focusing on the advantages of promoting students' positivity in learning and opportunities to solve problems, students have the opportunity to integrate knowledge from many subjects in the process of completing completed tasks. into product. To use the project method effectively and limit the disadvantages of this method such as being time consuming and difficult to accurately assess each individual's capacity after the product is completed, teachers need to follow the process. 3 steps as above; Select projects that are suitable for students' characteristics and abilities and are linked to real life.

References

1. Beineke JA. And There Were Giants in the Land. The life of William Heard Kilpatrick . New York, Peter Lang, 1998.
2. Campbell J. Understanding John Dewey. Nature and cooperative intelligence. Chicago and La Salle, IL, Open Court, 1995.
3. Ha Huy Khoai and colleagues. Math 4. Vietnam Publishing House, 2022.
4. Kilpatrick WH. The Project Method. Teachers College Record, 1918.
5. Kilpatrick WH. Foundations of Method. Informal talks on teaching. New York, The Macmillan Company, 1926.
6. Ministry of Education and Training. General education program - Experiential activities and experiential and career guidance activities (issued together with Circular No. 32/2018/TT-BGDDT dated December 26, 2018 of the Minister of Education and Training, 2018.
7. Nguyen Huu Hop. Designing lessons to develop primary school students' capacity. Pedagogical University Publishing House, 2018.
8. Nguyen Thi Viet Ha. Using the project method to improve teaching capacity integrating climate change education for geography students. Doctoral thesis, 2016.
9. Stockton JL. Project Work in Education. Houghton Mifflin, 1920.
10. Tenenbaum S. William Heard Kilpatrick: Trail blazer in education . New York, Harper & Brothers, 1951.
11. Trinh Van Bieu, *et al*. 2011. Teaching projects from theory to practice. Ho Chi Minh City University of Pedagogy Science Magazine, 1951, 28.
12. UNESSCO. Education for all. The United Nations Education, 2015.