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Review Article

Applying Design Thinking Process in Organizing Project Based Learning for Elementary Students

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Abstract: Design thinking is not only a highly humanistic intelligent problem-solving process, widely applied in many fields. For early childhood education, Design thinking has the potential to become an effective method of organizing educational activities. Project based learning is a form of teaching widely applied in all educational levels with an organizational model linked to reality, producing real-life products through "social role-playing" of learners. Applying Design thinking in Project based learning for Elementary students help them practice their ability to solve problems creatively, stimulate curiosity, the ability to observe, explore, apply, arouse interest and gain additional skills for presenting creative ideas. Our article gives definition, clarifying the steps of Design thinking; present the effects and applicability of Design thinking in Elementary school. This article also generalizes some characteristics of Project based learning and provides instructions for applying Design thinking in Project based learning in Elementary school.
Keywords: Design Thinking, Project-Based Learning, Elementary School, Elementary Student, Innovate Teaching Methods.

I. INTRODUCTION

In the context of global educational innovation, there is a growing emphasis on developing students' creative thinking, problem-solving abilities, and adaptability to real-life situations from an early age. Among various modern teaching approaches, *Project-Based Learning (PBL)* stands out as a learner-centered model that encourages students to engage in authentic, meaningful tasks through collaboration and exploration. Simultaneously, *Design Thinking*—a human-centered, iterative process for solving complex problems—has emerged as a powerful educational tool, particularly in nurturing innovation and empathy in learners. While both methods have been effectively used across different education levels, the integration of Design Thinking into PBL in primary education is still a relatively new and underexplored area. Elementary students, with their natural curiosity and creativity, can greatly benefit from structured opportunities that allow them to generate ideas, prototype, and reflect through real-life projects. This study addresses the need to explore how the Design Thinking process can be systematically applied in organizing Project-Based Learning for elementary students. It aims to clarify theoretical foundations, demonstrate practical benefits, and propose an effective instructional framework that empowers young learners to become proactive problem-solvers in their educational journey.

II. LITERATURE REVIEW

Design Thinking
Is a creative problem-solving thinking process that can be applied in all areas of life. Design thinking has the potential to help the above methods and approaches overcome limitations. At the same time, Design Thinking should also be used as an independent method and approach that is effective and maximizes the creativity of learners.

Project-Based Learning
Is a form of teaching widely applied in all educational levels with an organizational model linked to reality, producing real-life products through social role-playing of learners. Applying Design Thinking in Project – based learning for elementary school students will help children practice their ability to solve problems creatively, stimulate curiosity, the ability to observe, explore, apply, and stimulate. Get excited and have more tools to present creative ideas.

Concept of Design Thinking
The concept of design thinking originates from an important work by Herbert Simon (1969) called

"Sciences of the Artificials". In this work, H. Simpon considers "design" as "changing existing circumstances into preferred ones" [1]. Then, with the collaboration of scientists, H. Simon introduced the concept of "Design Thinking" as a creative process developed from building ideas from problems. This concept is not limited to the field of design but is also applied in all areas and situations of life. Since then, design thinking has been used increasingly widely in different communities and has been considered "a mindset and approach to learning, collaboration, and problem solving". For learning, collaboration and problem solving) [2].

Design thinking is used as a process or approach to solving problems, as a tool for finding solutions that meet the needs of users of creative products (hereinafter referred to as is "User"). It is especially effective for finding solutions to complex problems. Design thinking is a human-centered approach to innovation. Since Simon et al.'s original model, several variations of design thinking models have been introduced and applied to different fields. This process includes different stages according to three main stages: Inspiration, Ideation and Implementation [3]. Among the different versions of design thinking, the most commonly used model is the 5-step model created by Stanford University, which includes 5 main steps (Diagram 1).

Diagram 1: The Five Design Thinking Step

Many people concretize design thinking into 6 steps: in addition to the above 5 steps, bonus step 6 - Pitching, which is essentially a separate stage of the testing step. Pitching is a creative activity to introduce products, call for funding and make people understand the designer's solution.

Although the above 5 or 6 steps of the design thinking process appear to be sequential, design thinking is not entirely a linear process but is iterative and iterative at each stage. It is very likely that the implementer will discover new things that require them to go back and repeat the previous step to get the most creative design.

Benefits of Applying Design Thinking

Design thinking has spread from the design field to business. It can be applied in everyday life such as growing plants, raising animals, housework, etc. Design thinking can also create creative problem solving in the fields of psychology, education, health,

agriculture, engineering, technology, etc. In education, Design Thinking has been applied to innovate teaching methods from Preschool Education to higher levels of education. The Design Thinking method or process helps learners acquire the skills of 21st century citizens and become global citizens based on the initial starting point of love, understanding and desire. hope to solve the "pains" and "painful problems" of the community. It is a spirit of approach to solving problems in a humane, creative and optimal way.

Characteristic of Project - Based Learning

Project-based learning is a form of student-centered teaching method. Teacher play the role of a guide, consultant, creates an environment, creates problem situations, while learners are active students, proactively acquiring knowledge and skills. From there, create products for reporting and presentation. Project - based learning has many outstanding advantages (Diagram 2).
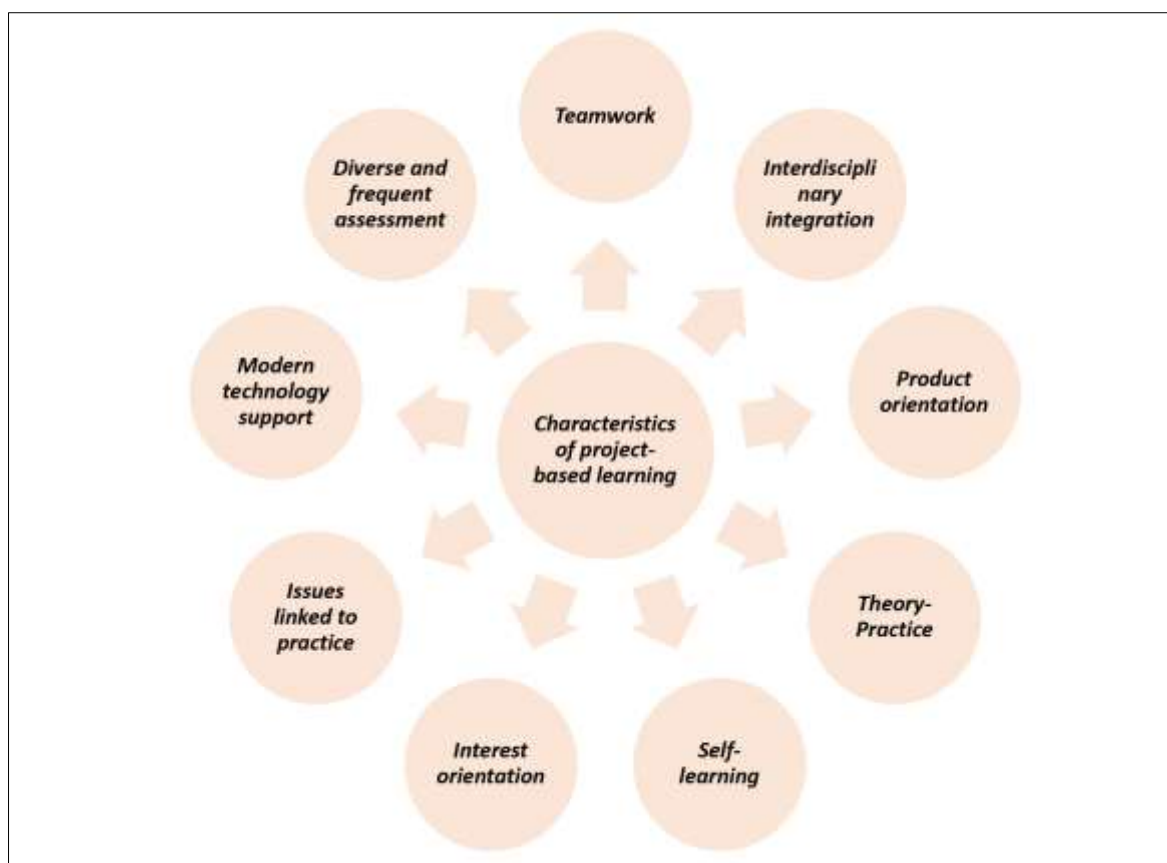
Diagram 2: Characteristics of Project-Based Learning

However, Project-based learning has 3 core mandatory features:

1) Derived from practice
2) There are "Social Roles"
3) Have actual products

"Social roles" are the specific activities of people living in society, often defined according to occupation, position, concept of life, personal capacity... Characteristics of "social roles" are sometimes potential. hidden in practical problems. However, we separate this feature to highlight the important role that makes up the "real but not real" nature of Project-based learning activities. "Social roles" are associated with reality but are not problems that bring "pain" (Pain) that needs to be resolved or excitement that can become a trend (Gain). These "pains" and "gains" will be considered to build ideas for the project.

In project-based learning, tasks are often complex in nature, with learning content linked to real problems in practical life (career, society, life). Instead of dry, dogmatic learning, learners can directly practice and create products. Learners have their own interests and difficulties, so their interests are often different. They can directly participate and choose topics suitable to their abilities, interests and personal interests. Project tasks are often integrated in nature, so to solve problems,

teachers and learners need to apply knowledge from many fields to create real products.

Learning therefore becomes as vivid as the surrounding life, not dry, dogmatic, or academic. Learners also need to "play social roles" to be a worker, security guard, doctor, researcher, reporter, scientist, director, designer... to do social tasks. The wall surrounding the learner will be broken. At this time, the classroom wall is broken, there is no longer a teacher and a learner, the classroom is only a miniature social context. Learners must operate "social roles" in accordance with the rules of real life. They study but it's like they don't study. Along with working in groups, their skills will develop rapidly.

The main goal of project-based learning is the process and learning effectiveness, not the product itself. Project-based learning helps solve real-life problems associated with internal education. Therefore, this form of teaching easily attracts learners because of its high practical applicability, helping learners solve their own problems, help their own lives and contribute to community benefits copper.

The project-based learning process consists of 5 steps, starting with detecting the project from the problem in the real world (Diagram 3):
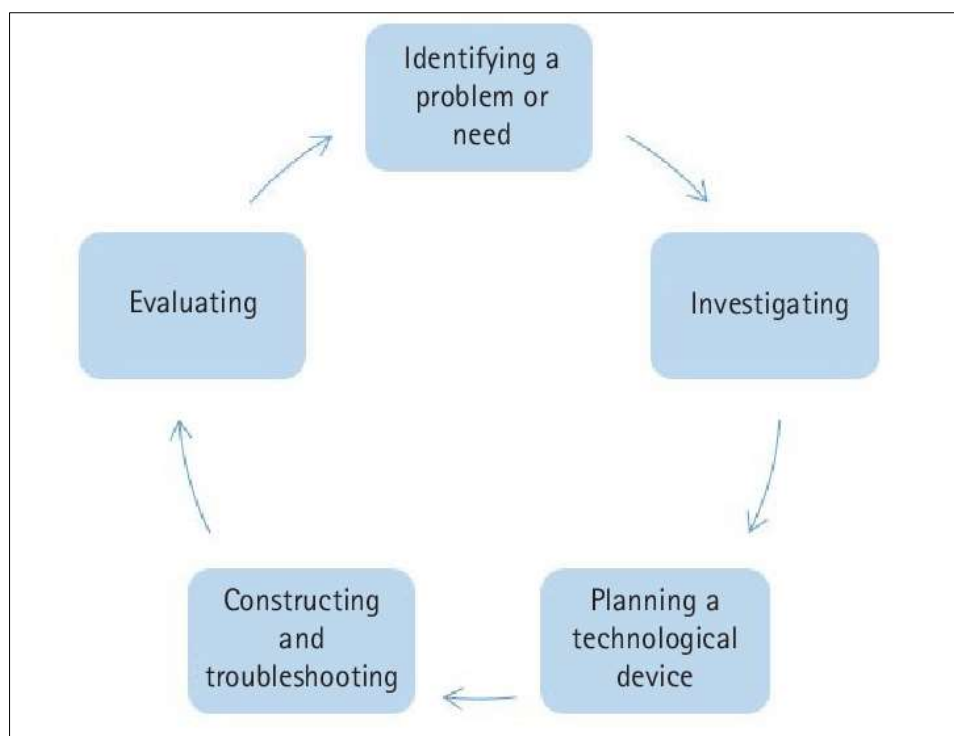
Diagram 3: Project-based Learning process

Common Problems of Primary Teachers in Project-Based Learning

Any child can feel difficult because of a narrow balcony, not enough space to plant trees or how to raise a favorite animal... Children may love to make simple items for themselves, for everyone in the family... And children are also very curious about adult activities: how adults organize a meeting, how to organize exhibitions, how to create a book, how to build a bridge... Children's curiosity and difficulties in daily life are the motivations that motivate children to be self-aware and excited to participate in educational activities organized in the form of project-based learning However, when organizing project-based learning or learning in general and for students in particular, teachers often face some difficulties, even some limitations as follows:

(1) Confusion between "Project-Based learning" And "Teaching Project"

A teaching project is a series of teaching activities linked together to achieve an educational goal and outcome. Teaching projects come in different sizes:

- Small projects: implemented during a number of lessons, which can be from 2-6 lessons.
- Medium Project: a project for one or several days ("Project Day"), but is usually limited to approximately one week or 40 hours of study.
- Large project: a project that is implemented with a large amount of time, a minimum of one week (or 40 hours of study), which can last for several weeks ("Project Week").

Projects can be large-scale, lasting the whole semester, school year, etc. with many diverse activities but with clear themes and goals.

Project-based learning is a form/method used in teaching. With this form, learning will be turned into a number of real activities such as in society: contests, meetings, exhibitions, book publishing, conservation campaigns, festivals, court hearings, etc. When using this form, class hours will no longer be limited to the classroom and there will also be no more "shadows" of teachers and students. We will only see a machine with "social roles" operating to complete a social project. Students will play different "social roles", create different products and develop competencies through role-playing and product creation.

Some teachers are still confused when they think that the fact that they are implementing a teaching project with students is that they have used the Project-based learning form/method. But in fact that Project-based learning needs to ensure its characteristics. If we have not yet seen "social roles" appear, it means that there isn't Project-based learning. If we see that there are "social roles" but still see the role of teachers and students in the classroom, not yet creating actual products, Project-based learning is still being applied incorrectly.

(2) Consider Finding Ideas for Project-Based Learning as the Teacher's Task, No the Student's Task

Teachers will usually propose and develop a plan for Project-based learning on their own. Students will be the ones who follow the teacher's guidance and plan. That makes the ideas for building projects in for Project-based learning can be subjective, not close and practical to students. Therefore, many project products will be difficult for students to apply in their own lives

and quickly end their life cycle as soon as for Project-based learning ends. If you leave the reality of the learners themselves, even if teachers try to organize for Project-based learning with modern technology, using many methods to activate students' activities, they still fall into the situation of "learning is very fun, but it's okay not to study".

(3) Thinking That the "Social Role" Is Too Difficult and Too Early for Students

Teaching activities need to be designed in accordance with the age of learners. By the time a child is 6 years old, their brain already weighs about 85% of an adult's brain. Between the ages of 6 and 11, the higher-level nervous system is also improving in terms of function, so children's thinking will gradually shift from visual action to abstract and figurative thinking. The ability to generalize develops with age, in which children in grades 4 and 5 often begin to know how to generalize reasoning. However, the activities of analyzing and synthesizing knowledge of children at this age are still sketchy and general. Emotions are pure, innocent but changeable, not really deep and sustainable. Cognitive processes such as perception, thinking, memory, and imagination began to develop strongly, although there were still certain limitations. Children begin to form a sense of morality, self-esteem, and basic personality qualities. The children are extremely interested in games that require intelligence and thinking. The children also like to exercise, squirm, run and jump. Children's will and behavior are immature, easily influenced by external influen CES. When organizing for Project-based learning, it is necessary to pay attention to the duration, volume, and intensity of activities of the "social roles". Teachers should only let children work in some areas of the "social role" that are suitable for them, even complete at a "symbolic" level. Asking to complete the "social role" in an honest and rounded way is sometimes too difficult and too early for children. When teachers set inappropriate requirements, it can lead to the situation of having to support children openly or replace them in some stages. Therefore, these support activities will lose the specificity of for Project-based learning.

(4) Not Attaching Importance to Letting Children "Tell Their Own Stories" About the Project's Products

Products of Project-based learning will be lived in the middle of life and evaluated by users and customers. However, to detect problems in practice, come up with ways to solve problems and create good products, very in-depth guidance tools are needed. This can confuse many teachers. If there are not enough tools, the use of the project-based teaching model will only be a formality, students will still be actors who have not "rounded their shoulders".

Products of Project-based learning are presented and introduced to the public because children's language is often limited, children are not proficient in using information technology means... In addition to the

opinions of teachers and classmates, it is very difficult for children to know the opinions of others about their products. If children do not have the opportunity to adjust the product after Project-based learning ends, the formation of capacity also becomes half-hearted. Too high requirements for children to present products is not feasible. However, we can still use tools at the simplest level to support children to tell their product stories creatively.

(5) Unproviding Children with Enough Tools to Come Up with Ideas, Discuss in Groups and Agree on Ideas and Solutions

Children of primary school age have the ability to generalize, state and defend personal opinions. However, when working in a group, children need to be instructed on how to give opinions, vote and agree on opinions. Teachers can use mind maps and empathy diagrams, combined with the guidance of communication skills (Diamond Suggestion Principle, Collective Respect Principle, Only One Person Speaks, Punctuality Principle, No Fool Principle...) to help children work effectively in groups.

III. RESEARCH RESULTS

3.1 How is Design Thinking Applied in Project-Based Learning at the Primary Level

Design thinking with an "empathetic" heart provides a solution that can overcome the limitations of teachers when using project-based learning forms/methods:

1) The theory of empathy of design thinking provides a full range of tools for teachers to guide students to find the "Hidden Truth" hidden deep in the user. It is also the basis for teachers to start project-based learning and also the basis for children to generalize the needs of users, find the right "pain" and difficulties to focus on solving.

– Design thinking points out 4 ways to be able to collect information effectively: Self-commitment, self-experience, self-placement in the user's position;

– Observe the user, observe the surrounding environment from the user's perspective to find new perspectives and explore user behavior;

– User interviews;

– Research the material that is relevant to the user.

Design thinking encourages teachers and students to take notes and systematize empathetic information with empathetic charts (Diagram 4). Empathy charts require the practitioner to use empathy tools to gather information about the words, actions, thoughts, and feelings of the subject to empathize. Teachers can encourage history children to record the information they find in a simple, fast, and easy-to-understand way on an empathy chart. From the empathy chart, teachers and children will generalize useful data to

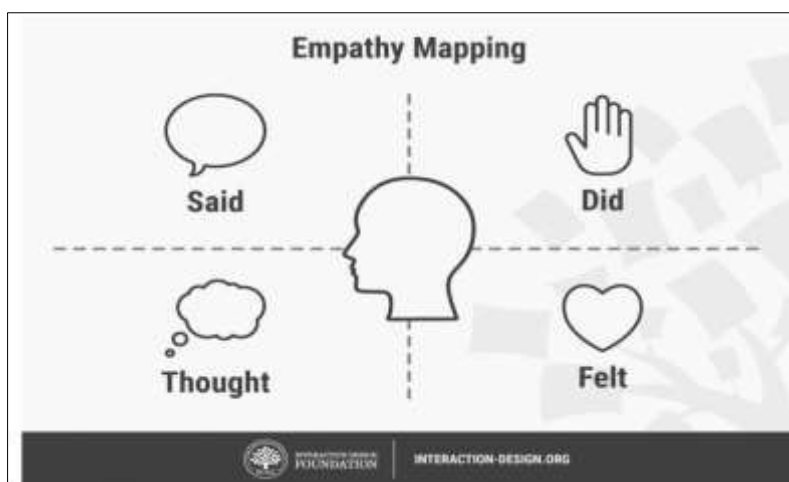find out the needs that need to be solved by society and users.

Empathy Mapping

Said

Did

Thought

Felt

INTERACTION DESIGN FOUNDATION | INTERACTION-DESIGN.ORG

Diagram 4: Empathy Chart

2) Users and their "pain" are objects that need to be empathized. However, in order to empathize with people or their "pain", it is necessary not only to observe themselves but also to expand the scope of understanding to the people around them, the living environment, and the cultural environment; not only listen to their answers, but also listen to expressions from eyes to smiles, consider how to behave... For primary school children, asking them to find the "implicit truth" in the depths of cognition is a high requirement, even impossible for them to do. Therefore, teachers need to choose simple, suitable and oriented objects for children.

3) The 6th step of the design thinking process (Pitching) is further developed from the 5th step (Test). This is a step in the development of design thinking in the process of perfecting its own process. In fact, project-based learning products can go very far when participating in creative competitions, inventions, becoming community projects that need to be responded to by the public or startup projects that need to call for investors. In the classroom, project-based learning products also need to have a scientific and creative way of reporting and presentation to receive high appreciation. Pitching techniques recommended in design thinking will help students have reports, presentations, and communication for their products creatively. Students can turn a presentation with slides presented one after another in a traditional style into a report, story, a humorous play, intellectually impacting all the senses of the audience. Students can flexibly combine many forms of presentation depending on the audience to attract attention and support...

Piching is a flexible and effective form of helping product creators convey a message to the desired audience. In addition, pitching sessions at the end of the project can be turned into contests, exhibitions, demonstrations, etc. Attracting parents to join hands with the school to educate students and socialize education. Primary school children should be instructed to pitch at simple levels so that they can easily work in a team. Teachers can have children present the results briefly in the form suggested in advance around the main issues: Product name, the sampling process takes place in the group, Benefits of the product, Limitations of the product...

Teachers can also guide students to perform small, simple plays to talk about the product with a 3-step structure:
Act 1: focuses on the user's difficulties;
Act: 2 focuses on helping users solve difficulties with their solutions and products;
Act: 3 is a happy ending for everyone thanks to the effect of the product.

Teachers can turn pitching into a small competition between groups in the class provided that this competition is part of a "social role" activity. The contest can have the participation of other teachers, social objects (neighborhood leaders, parents, scientists, entrepreneurs...) to stimulate children's excitement. Teachers should also encourage children to present humorously and creatively. The children's smart and lovely expressions will be considered as the highlights that make pitching activities the most anticipated activities of project-based learning.

3.2. DISCUSSION

Design thinking is not a sequential process but just a list of tasks, depending on the specific situation, we can choose what to do first, even take many steps in

parallel to save time to the finish line. We can use the 6 steps of Design Thinking, integrated into the 5 steps of project-based learning to implement this form of teaching more effectively.

Integrate Empathy into All Steps of Project-Based Learning

Teachers orient children to empathize in the family and outside society by simply using empathy tools, to find out the "pain" and "gain" of everyone around them with suggestive questions: how tired are parents and why; what you want to do that you find difficult to do; Are the trees around you lush, why?... The teacher and the child gather in an empathy chart to find ideas for a project that can solve one of the problems that the child is most interested in. In case the sample product or proposed solution is missing or cannot be applied, the tools and processes of the empathy step continue to be applied at any stage of project-based learning, helping teachers and students find new ideas and solutions.

Integrate the Techniques of Problem Identification, Ideation, Prototyping, and Testing Into the Plan Implementation Step in Project-Based Learning

The steps of Problem Identification, Ideation, Prototyping, and Testing in the design thinking process can effectively support the implementation of project-based learning plans by encouraging the use of team activity techniques, group discussions, product sizing, and making the most of each individual's strengths to create products. Some commonly used tools: SCAMPER, Eisenhower diagrams, "Show don't tell" rules... However, when using those tools for students, teachers need to transform those tools into drawings and diagrams with simple rules of operation and instructional language. This work requires more research and testing time to arrive at more optimal results.

Integrating Pitching Techniques into the Presentation of Results

Finally, pitching step needs to be properly recognized as its independent role. It can be transformed into a testing and assessment tool or a form of connecting preschools with parents or connecting preschools with social forces to support education. Thanks to the storytelling step, products of design thinking reach the audience strategically and create momentum for children to acquire the skills to succeed in life.

Combining Empathy and Pitching To Have an Additional Tool to Measure Children's Outcomes in Project-Based Learning

For primary school students, testing and assessment must not become a psychological burden for children. Children still need to know the opinions of others about their "social roles" and products. This not only helps teachers re-evaluate the reality or feasibility of projects, but also helps children self-assess the success of solutions and model products. This is a premise for primary school students to be interested in the next projects and practice the thinking and skills of 21st century citizens. The evaluation through pitching will become fairer if there is the participation of social objects, or it is referred to by the votes of individuals in the classroom for other teams, their own teams, etc.

IV. CONCLUSION

Teachers encourage and praise the spirit of creativity through comments on rewards and badges appropriate to the age of children. Post-pitching products need to be commented on, adjusted and encouraged to apply to achieve the goal of project-based learning. The application of design thinking in project-based learning is a way to supplement and complete the method in the "pedagogical toolbox" of primary school teachers. It opens up a humane path for the education of children to really bring a lot of joy and achieve highly practical benefits.

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