International Journal of Social Science and Human Research

ISSN (print): 2644-0679, ISSN (online): 2644-0695

Volume 08 Issue 04 April 2025

DOI: 10.47191/ijsshr/v8-i4-69, Impact factor- 8.007

Page No: 2530 - 2534

Proposed Measures for Fostering Design Thinking Competencies in Primary School Students in The Context of Vietnam's General Education Reform

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ABSTRACT: Design Thinking (DT) is considered one of the essential competencies that should be developed for primary school students in the context of educational innovation and digital transformation. This study aims to analyze the current situation of developing design thinking for primary school students in Vietnam and to propose a system of specific measures to foster this competency through practical, creative, and problem-oriented learning activities. Based on theoretical research and practical analysis, the study proposes four key measures: (1) Organizing learning activities based on the design thinking model; (2) Enhancing experiential activities and project-based learning associated with real-life situations; (3) Creating a creative learning environment and encouraging students to experiment; and (4) Developing students' skills in critical thinking, evaluation, and product improvement. The research findings confirm that these measures not only enable students to fully experience the essential components of the design thinking process (Empathize, Define, Ideate, Prototype, Test, and Refine) but also contribute to fostering important competencies aligned with the requirements of competency-based education as outlined in the 2018 General Education Curriculum of Vietnam.

KEYWORDS: Design thinking, students, primary education, measures, development

I. INTRODUCTION

In the context of digital transformation and the current demand for educational innovation, the development of learners' creativity and problem-solving skills has become an inevitable trend in global education. One of the important orientations contributing to this goal is the development of Design Thinking (DT) for students from the primary education level. DT represents a modern educational approach that plays a vital role in fostering creative thinking skills, complex problem-solving abilities, collaboration, and adaptability in ever-changing learning and working environments (Razzouk & Shute, 2012) [17)].

Design Thinking is commonly understood as an analytical and creative process that engages individuals in opportunities for experimentation, creativity, prototyping, feedback collection, and redesign (Razzouk & Shute, 2012) [17)]. It is a structured thinking process that focuses on problem-solving through a learner-centered approach, emphasizing understanding of real-world needs, generating creative ideas, prototyping, and evaluating solutions or products (Brown, 2009) [1)]. The nature of Design Thinking is to immerse participants in situations where they think and work like professional designers, thereby promoting social understanding, empathy, cultural awareness, and risk-taking (Author, 2016) [16)]. The importance of design and Design Thinking has recently been recognized in school education, particularly within the current STEM education movement.

Research on design and Design Thinking is not new, especially in the field of engineering (e.g., Dym et al., 2005; Simon, 1973, 1996) [3)], [19)], [20)]. However, the meaning of "design" and "Design Thinking" remains open and is interpreted differently across disciplines (Exter et al., 2019; Johansson-Sköldberg et al., 2013; Kolko, 2018; Wrigley & Straker, 2015) [7)], [9)], [12)], [22)].. To study and characterize Design Thinking in engineering and other fields, multiple approaches and perspectives have been developed and applied, including: (1) modeling the design process (e.g., Dym & Brown, 2012; Schön, 1983; Simon, 1996) [4)],[18)],[20)]; and (2) identifying and describing strategies, tactics, and skills in Design Thinking (e.g., Lawson, 2006; Wendell et al., 2017) [13)],[21)].

In general education, design has increasingly been recognized not only as a subject for students to study and experience (e.g., English, 2018; McFadden & Roehrig, 2019) [6)], [15)], but also as an important approach for forming and developing integrated STEM education in K-12 schools (e.g., English, 2015; Kelley & Knowles, 2016) [5)], [10)]. The core components of students' Design Thinking have been clearly identified, including: (1) Empathy [8)], [17)]; (2) Problem Definition [11)], [14)]; (3) Ideation [1)], [5)]; (4) Prototyping [14)], [15)]; and (5) Evaluation and Product Improvement [8)], [17)].

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Developing Design Thinking for students has received increasing attention and has been implemented at different educational levels. English and King (2015) argued that organizing learning activities based on the STEM/STEAM model is an effective method to develop students' Design Thinking, especially through product design projects and solving complex, creative real-world problems [5)]. Moreover, experimental studies in various countries have shown that Design Thinking should be developed early at the primary level when students are in the foundational stage of cognitive development and creative thinking. The study of McFadden and Roehrig (2019) demonstrated that primary school students who participated in STEM projects integrated with Design Thinking made significant progress in generating ideas, explaining solutions, and collaborating in teamwork [15)].

Although Design Thinking has attracted considerable attention from practitioners and scholars in various fields, this widespread interest has often been described as problematic in academic forums (Author, 2016) [16)]. However, in Vietnam, studies on the development of Design Thinking for primary school students remain relatively limited. Existing research has mainly focused on analyzing the concept and role of Design Thinking in education, with very few empirical studies or proposals of specific measures to develop this competency for primary school students. In particular, in the context of Vietnam's strong implementation of STEM and STEAM educational activities, the integration and development of Design Thinking for primary school students not only have theoretical significance but also profound practical value in innovating teaching methods in schools.

For these reasons, this study was conducted to propose several specific measures to develop Design Thinking for students through active, creative learning activities aimed at solving real-world problems in their learning and daily life.

II. METHODOLOGY

The theoretical research method was employed to study relevant documents, scientific works, and both domestic and international studies related to design thinking, competency development, and innovation in teaching methods in primary education. This method facilitated the systematization of the theoretical framework, clarifying the concepts, characteristics, structure, and process of design thinking. At the same time, it served as a basis for proposing specific measures to develop design thinking for primary school students in Vietnam.

III. RESULTS

A. Organizing Learning Activities Based on the Design Thinking Model

The first measure to develop design thinking for primary school students is to organize learning activities based on the Design Thinking model. This measure focuses on designing and structuring the teaching process according to the five fundamental stages of design thinking, including: Empathize, Define, Ideate, Prototype, and Test (IDEO, 2015).

The learning process following this model provides students with numerous opportunities to develop all components of design thinking in specific learning contexts. In the Empathize stage, students practice listening, observing, and understanding the needs and desires of others — the beneficiaries of the products or solutions they are designing. This serves as a crucial foundation for fostering humanistic thinking and the ability to put oneself in others' positions to better understand the problems to be solved.

In the Define stage, students are guided to analyze relevant data, clarify the requirements and criteria of the learning task, and identify specific goals to be achieved. The Ideate stage creates a space for students to brainstorm, propose multiple solutions, and maximize their creativity and teamwork skills.

After selecting the appropriate solution, students proceed to create a preliminary product or prototype to test their design ideas. This stage helps students practice hands-on skills, experiment, and adjust ideas in an open learning environment. Finally, students test their products, receive feedback from teachers and peers, and make adjustments and improvements. Through this process, students not only develop self-assessment skills but also cultivate an open-minded attitude and a willingness to incorporate feedback to optimize their designs. Thus, organizing learning activities based on the Design Thinking model creates favorable conditions for primary school students to comprehensively develop all components of design thinking while practicing problem-solving, creative thinking, and collaboration skills.

B. Enhancing Experiential Activities and Real-World Project-Based Learning

The second measure to foster design thinking in primary school students is to enhance experiential activities and project-based learning closely connected to real-life situations. This measure creates a rich experiential learning environment where students engage in solving problems arising from real-world contexts relevant to themselves and their communities. Through project implementation, students have the opportunity to analyze real-life problems, thereby practicing their ability to understand the needs and expectations of product users or stakeholders affected by the problem — a core element of the Empathize stage in design thinking (English & King, 2015).

Moreover, project-based learning enables students to clarify learning objectives, identify requirements, criteria, and challenges to be addressed during task implementation (Define stage). Under teacher guidance, students are encouraged to discuss,

brainstorm, and propose multiple creative ideas and solutions to solve the given problems (Ideate stage). This provides students with opportunities to apply flexible and creative thinking, develop individual competencies, and practice teamwork skills.
After selecting the optimal solution, students practice designing specific products or experimental models to express their ideas and solutions (Prototype stage). Finally, students present their project results, receive feedback from teachers and peers, and revise and improve their products based on constructive comments (Test stage). This measure not only enables students to apply and develop all components of design thinking but also equips them with problem-solving skills in real-world contexts, effectively connecting classroom knowledge with everyday life.

C. Creating a Creative Learning Environment and Encouraging Experimentation

The third measure to develop design thinking for primary school students is to create a creative learning environment and encourage experimentation. This measure plays a crucial role in shaping an open, friendly, and supportive learning space, allowing students to maximize their creativity, experiment with ideas, and not fear making mistakes during the learning process. The core content of this measure involves equipping creative learning spaces (e.g., Maker Spaces, STEM classrooms), setting up product display areas, providing appropriate learning materials and equipment, and encouraging students to engage in design and production activities linked to real-life contexts.

A creative learning environment not only provides students with the freedom to sketch ideas, experiment, and design products based on their own ideas but also helps them practice prototyping — a critical component of design thinking (McFadden & Roehrig, 2019). Additionally, building a learning space that encourages experimentation contributes to creating a positive learning culture where students are unafraid of failure, willing to think, act, and boldly experiment with new ideas. This fosters students' creativity and breakthrough thinking in problem-solving.

Furthermore, when students have the opportunity to experiment, test, and adjust their products multiple times in a friendly learning environment, they gradually form habits of self-monitoring, self-assessment, and continuous product improvement. This is a vital opportunity for students to practice critical thinking, evaluation, and product optimization skills, thereby comprehensively developing the essential skills and qualities of design thinking in learning and life.

D. Practicing Critical Thinking, Evaluation, and Product Improvement Skills

This measure is essential for forming and developing students' self-assessment capacity, critical thinking, and ability to improve solutions while participating in creative design learning activities. The core content of this measure is to organize activities where students comment on and provide feedback on their peers' products while practicing self-assessment based on specific criteria guided by the teacher.

Through commenting and providing constructive feedback on peers' products, students practice observation, analysis, and constructive critical thinking skills, contributing to improving the group's or individual's products (Razzouk & Shute, 2012). This is an opportunity for students to develop the Test component in design thinking, thereby forming logical thinking, objective evaluation, and active critical thinking skills in learning.

Additionally, encouraging students to accept objective feedback from teachers and peers helps them develop flexible thinking, open-mindedness, and a willingness to adjust and optimize their design products. The process of receiving feedback, re-evaluating, and modifying products provides favorable conditions for students to practice product improvement skills — one of the critical skills of design thinking. Through this, students gradually form scientific working habits, learn to view problems from multiple perspectives, and continuously improve solutions to achieve optimal effectiveness in learning and solving real-world problems.

E. A Practical Example in Science Education

The lesson "Protecting Water Resources and Some Methods of Water Purification" (Grade 4 Science) is considered a learning context with great potential and favorable conditions for developing design thinking in primary school students. This topic is closely linked to real-life situations, familiar to students' daily living environments, and directly related to global issues such as environmental pollution, clean water crises, and natural resource conservation. With these characteristics, the lesson not only provides scientific knowledge about the causes and consequences of water pollution and water purification methods but also creates many opportunities for students to explore, experience, solve problems, and create suitable solutions in specific real-world contexts.

In particular, the learning activities in this lesson allow students to participate in and fully practice the stages of the Design Thinking process (IDEO, 2015), including Empathize, Define, Ideate, Prototype, and Test. Specifically, through exploring the causes of local water pollution, students have the opportunity to practice empathy by observing, listening, and understanding the difficulties and negative impacts that residents and the environment face due to water pollution. Next, students are guided to clearly identify the problem to be solved — seeking and implementing actions to protect water resources and use water efficiently in their families and communities.

Based on this, students are encouraged to propose multiple creative ideas for protecting and purifying water, such as collecting rainwater, reusing domestic water, and applying simple water filtration methods using materials like cotton, activated carbon, sand, gravel, or alum, suitable to their family or local conditions. Particularly, during the process of practicing water purification and implementing water conservation actions, students have the opportunity to engage in prototyping, experimentation, and comparing results between different options. Finally, students test, evaluate the effectiveness of the implemented measures, listen to feedback from teachers and peers, and make adjustments and improvements to achieve better outcomes.

Thus, it can be affirmed that the lesson "Protecting Water Resources and Some Methods of Water Purification" not only contributes to developing students' environmental awareness and behavior but also serves as an important learning opportunity to form and develop design thinking competencies. Through this learning activity process, students are comprehensively trained in the components of design thinking while developing positive qualities, a sense of responsibility, and environmental protection awareness in the context of modern education.

IV. DISCUSSION

The findings of this study indicate that the system of measures proposed for developing design thinking in primary school students is not only grounded in scientific theory and aligned with the developmental characteristics of young learners, but also demonstrates high feasibility and practical relevance in the current educational context. Each measure was systematically designed to provide optimal conditions for students to engage fully in the key components of design thinking while closely linking learning activities to real-life contexts and students' immediate environments.

In practice, organizing learning activities based on the Design Thinking model has proven to be a core strategy for helping students acquire essential design thinking skills through classroom experiences. For example, in the Grade 4 Science lesson "Protecting Water Resources and Methods of Water Purification," students participate in a structured learning process consisting of: empathizing with local communities affected by water pollution, defining the problem to be addressed (i.e., conserving and protecting water), generating multiple solutions (e.g., water reuse and filtration), creating prototypes using simple materials (e.g., cotton, activated charcoal), and finally testing, evaluating, and refining their solutions. This activity not only fosters students' problem-solving and creative thinking abilities but also cultivates a sense of responsibility and environmental awareness.

Furthermore, the implementation of experiential and project-based learning activities linked to real-world situations has created meaningful opportunities for students to apply design thinking in addressing everyday challenges. For instance, in experiential tasks such as designing school playgrounds, creating learning tools from recycled materials, or conducting clean vegetable gardening projects, students learn to observe and empathize with user needs, develop creative ideas, prototype products, and refine solutions tailored to the actual conditions. These real-world projects offer valuable contexts for cultivating design thinking elements in a natural and authentic manner.

The establishment of a creative and experimental learning environment has also played a crucial role in motivating students throughout their learning and innovation processes. An open, supportive, and experience-rich classroom setting enables students to embrace failure, take initiative, and iteratively refine their ideas to achieve better outcomes. Such conditions are fundamental in fostering creative habits, flexible thinking, and self-directed learning skills among primary school students.

In addition, the measure focused on practicing critical thinking, evaluation, and product improvement has shown clear effectiveness in developing students' abilities to test and refine their work. By participating in peer feedback sessions or conducting self-assessments, students learn to receive multi-perspective input, analyze issues objectively, and optimize their solutions. This iterative feedback loop nurtures reflective thinking and enhances their capacity for continuous improvement — a vital component of design thinking.

Taken together, the proposed system of measures not only contributes important theoretical insights into the development of design thinking in primary education but also holds strong practical implications that align with the contemporary trend of educational reform. However, to maximize the effectiveness of these measures in real-world teaching contexts, comprehensive investments are required — including the provision of adequate facilities, learning resources, and instructional equipment — as well as the active involvement of teachers, school administrators, and parents.

CONCLUSION

Design thinking is considered one of the essential skills for students in the context of modern education, especially as the development of problem-solving competence, creative thinking, and adaptability to real-life situations is increasingly emphasized in the new general education curriculum. The study has affirmed both the necessity and feasibility of developing design thinking for primary school students through the implementation of appropriate teaching measures, aligned with students' developmental characteristics and the practical conditions of schools. Based on theoretical research and practical analysis, this paper has proposed a system of four specific measures to foster design thinking for primary school students. These measures include: organizing learning activities based on the Design Thinking model; enhancing experiential and project-based learning activities connected to real-life

contexts; creating a creative learning environment and encouraging experimentation; and practicing critical thinking, evaluation, and product improvement skills. The results of the analysis and discussion indicate that the proposed system of measures is not only theoretically grounded but also highly practical. Learning activities organized with a design thinking orientation have created favorable conditions for students to fully experience the essential components of the design thinking process, including empathizing, defining problems, ideating, prototyping, testing, and refining solutions. Moreover, through specific illustrative examples, it can be affirmed that developing design thinking for primary school students not only contributes to the innovation of teaching methods but also helps to form and develop essential competencies for students, meeting the requirements of fostering qualities and capacities in learners as set out in the 2018 General Education Curriculum of Vietnam.

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