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STATION-BASED LEARNING TO ENHANCE THE COMPETENCY OF PROBLEM-SOLVING AND CREATIVITY FOR PRIMARY STUDENTS IN VIETNAM

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Abstract. Station-based Learning (SBL) is an instructional process that engages students in sequential learning activities at different stations, thereby enhancing their collaborative skills, critical thinking, and creativity. In the context of primary education reform in Vietnam, which focuses on competency-based education aimed at developing students' core qualities and competencies, SBL plays a pivotal role in fostering students' competency of problem-solving and creativity. However, designing and implementing SBL effectively to nurture this competency remains a challenge that attracts considerable attention from educators and researchers. This conceptual paper aims to analyze the theoretical foundations of SBL and clarify its relationship with the enhancement of the competency of problem-solving and creativity. The findings are expected to provide a theoretical basis and pedagogical implications for improving teaching practices in Vietnamese primary education.

Keywords: Station-based Learning, competency of problem-solving and creativity, primary education, General Education Program.

1. Introduction

The 2018 General Education Program (GEP) in Vietnam was developed with an orientation towards capacity development, through basic, practical, modern knowledge and active teaching methods that enhance learners' activities in subjects and educational activities. Students develop the qualities and competencies expected by schools and society, including problem-solving and creativity skills [1]. To ensure the effective implementation of subjects in the 2018 GEP, it is essential to innovate all aspects of the teaching and learning process. Innovating the teaching process will enhance educational quality, allowing students to continuously practice, form, and develop essential qualities and competencies for everyone. SBL is a teaching process aimed at activating learners' cognitive activities through a structured rotation of tasks. Unlike single-method instruction, SBL integrates multiple methods and learning modalities within an organized process, enabling both differentiation and interaction.

Within the competency-based orientation of the 2018 GEP, SBL has been recognized as a potential process to connect learning tasks with real-life contexts, foster active exploration, and build cognitive autonomy among primary students. However, while SBL has been widely applied in international education systems, its theoretical grounding and contextual adaptation in Vietnamese primary education remain underdeveloped. This theoretical gap highlights the need to conceptualize how SBL functions as a process that contributes to the formation of key

competencies, especially problem-solving and creativity. To develop learners' competencies, the 2018 GEP has drawn on experiences of building general education programs from countries with advanced education systems, innovating objectives, content, methods, and forms of teaching. This helps students not only memorize but also apply their knowledge through specific activities, using what they have learned to address situations posed by teachers. In other words, students' tasks must be connected to real-life contexts, encouraging them to actively and proactively acquire knowledge based on their prior experiences and positive interactions with the learning environment. This, in turn, fosters critical thinking, creativity, and the ability to solve real-world problems.

Accordingly, the competency of problem-solving and creativity has become a central component in the GEP, reflecting the capacity to identify, analyze, and address unfamiliar problems while generating novel and valuable solutions. The competency of problem-solving and creativity enables individuals to effectively address situations they encounter, establish social relationships, adapt to new environments, or make new, valuable contributions. To survive and thrive in a constantly changing and developing social environment, every individual must possess the competency of problem-solving and creativity [1].

Despite increasing interest in SBL, theoretical and empirical research contextualized within Vietnamese primary education is limited. Therefore, this study aims to synthesize theoretical perspectives on SBL as a teaching process in primary education; analyze the mechanisms by which SBL supports the enhancement of problem-solving and creativity; and propose some orientations for enhancing the competency of problem-solving and creativity through SBL for primary students in Vietnam. The study contributes theoretically by clarifying the conceptual framework of the SBL process within competency-oriented primary education, and practically by suggesting orientations for teaching innovation in Vietnam.

2. Content

2.1. Overview of the process of Station-based Learning in primary school

2.1.1. The concept of Station-based Learning

SBL was initiated in the early 1900s and is considered an important technique in the literature on constructivist teaching by Piaget and Vygotsky [2]. It organizes classrooms into stations where learners engage in tasks that promote exploration, discussion, and reflection. Each station is a micro-learning environment that allows learners to explore, experiment, and reflect independently or collaboratively. In Vietnam, SBL is a relatively new concept referring to the process of organizing classroom activities through different learning stations. Through this process, teachers design and guide a sequence of interconnected tasks, enabling students to actively engage in inquiry, deepen their understanding of key ideas, and gradually develop cognitive and practical skills. SBL provides opportunities for students to overcome difficulties in learning new knowledge and in developing skills and techniques.

According to Aydogmus and Senturk (2019), SBL is a process in which students engage in a series of structured learning activities in specific areas by working individually or in groups, following specific instructions from the teacher or devised by the learners themselves to explore or review a particular topic. The classroom is organized into stations, which are learning areas where students can work on different topics or content simultaneously and rotate between stations following a designed sequence and timeframe [3]. At the stations, students engage in hands-on activities, take responsibility for their learning, and use a variety of tools and materials to construct and consolidate knowledge. Teachers are in charge of designing, organizing, and monitoring students, as well as providing scaffolding, feedback, and motivation. This dynamic interaction transforms each station into a flexible yet structured environment for creativity and

self-regulated learning.

Some research indicated that SBL plays a crucial role in providing opportunities for students to engage in independent and self-directed activities through diverse learning tasks, ensuring educational quality for all students while accommodating their varied characteristics and preferences [3], [4], [5]. Its impact has been evidenced through improvements in students' learning outcomes, retention of knowledge, attitudes, classroom engagement, and motivation [4]. Learning stations can be organized flexibly, depending on the topic, number of students, teachers' experience, and available resources. Tasks at stations are often tiered and sequentially arranged, guiding students from basic understanding to advanced application.

According to Kingnore (2011), SBL meets students' diverse needs through varying levels of feedback [5]. Effective learning stations provide tiered challenges, authentic contexts, and opportunities for continuous interaction and feedback, helping learners enhance autonomy, problem-solving, and creativity [5]. In the context of primary education, SBL provides a structured yet adaptable framework for integrating active learning strategies such as problem-based learning, cooperative learning, and experiential tasks. It also allows teachers to support individuals or small groups through questioning, encouragement, and feedback while students complete their assigned tasks. Research by Breckler and colleagues in 2011 demonstrated that organizing activities at stations helps students develop conceptual understanding and multiple competencies [6]. Gyeltshen and Dorji (2022) further confirmed that SBL effectively facilitates the teaching of abstract concepts [7].

For primary school students, SBL is characterized by developmentally appropriate, hands-on, and experiential activities that match their cognitive and emotional characteristics. Each station is designed to engage students through concrete experiences, visual aids, and interactive tasks that stimulate curiosity and sustain attention. The rotation structure supports short, varied learning cycles, allowing learners to explore concepts from multiple angles while maintaining motivation.

2.1.2. The process of Station-based Learning

Studies on the process of SBL demonstrate that it represents an integrated and dynamic system that reflects diversity in how learning activities are designed and implemented. It can take various forms, use diverse teaching tools, and can include evaluations based on students' task performance or products created during learning. Importantly, the process emphasizes students' self-assessment and reflection at each station, helping them monitor and regulate their learning progress. SBL, as a subsystem of the overall teaching process, includes structural components that are dialectically and functionally interconnected. Each component performs its function while simultaneously contributing to the general purpose of developing learners' competencies. When viewed holistically, the process involves components such as objectives, content, methods, tools, organizational forms, teachers and their teaching activities, students and their learning activities, and assessment. These components are not independent; they interact continuously to ensure the coherence and effectiveness of the teaching process. If any component is absent or ineffective, the process cannot operate fully. Specifically:

Regarding the objectives of the SBL process, they must be concretized through the requirements to be achieved in the lesson, the subject, or the GEP. In this process, the general competencies of learners are expressed through specific performance indicators, especially the competency of problem-solving and creativity, which must be reflected in lesson and subject objectives. Objectives at each station should direct students toward exploration, creative application, and reflective evaluation of knowledge and skills.

Regarding the content of the SBL process, it actualizes the objectives of SBL and must therefore be derived from the general education curriculum and primary education standards. The selection of content should focus on real-life contexts and practical applications that require

problem identification and creative solution generation. Teachers design content that allows each station to focus on relatively independent subtopics, ensuring both flexibility and coherence in rotation. Such content design encourages students to move from knowledge acquisition to problem-solving and creative application.

Regarding the methods of the SBL process, teachers combine various teaching methods to promote students' self-awareness, proactivity, and independent cognition. This interaction between teachers and learners helps develop competencies through structured inquiry and discovery. Within the station-based process, methods such as problem-solving, brainstorming, discussion, game-based learning, and role-playing activities are not applied separately but are embedded within each station's task to stimulate exploration and creativity.

Regarding the forms of the SBL process, teachers need to flexibly combine different teaching forms to engage students' interest and motivate them to complete tasks at the learning stations. The choice of organizational form depends on lesson objectives, students' characteristics, available resources, and the teacher's pedagogical capacity. At the primary level, the process often alternates between group and individual work to balance collaboration and independence, allowing all learners to experience different learning roles within the same process.

Regarding the tools of the SBL process, different tools are employed to stimulate perception, imagination, and creativity. Teaching aids serve as cognitive bridges that connect prior knowledge with new concepts, helping students independently identify problems, construct understanding, and propose solutions. Teachers are encouraged to develop and select diverse, cost-effective tools and materials to support inquiry, experimentation, and competency development.

Regarding the assessment of the SBL outcomes, teachers need to focus on students' learning outcomes as evidence of the process's effectiveness. Teachers evaluate students' competencies based on how well they meet the objectives of lessons and the degree to which they demonstrate problem-solving and creativity. Assessment should therefore combine teacher evaluation, peer feedback, and student self-assessment, emphasizing learning progress and reflection rather than final products. Developing rubrics that assess indicators such as idea originality, reasoning, and practical application is essential for evaluating competencies within this process.

In summary, the SBL process is a coherent system in which all components interact dialectically to promote the development of competency of problem-solving and creativity.

2.2. The issue of enhancing the competency of problem-solving and creativity for primary students in Vietnam

2.2.1. The competency of problem-solving and creativity of primary students

Among the various types of competencies, problem-solving and creativity is a core general competency for learners to adapt and innovate in modern education. Researchers and policymakers classify problem-solving as one of the most important competencies in the 21st century. Problem-solving refers to the ability to think and act effectively in situations where no ready-made solutions exist, requiring individuals to analyze problems, generate hypotheses, and select appropriate strategies. Newell and Simon (1972) proposed that the competency of problem-solving and creativity relates to a problem space, a description of intermediate states between the initial state and the target state, and involves searching for solutions by exploring personal experiences and strategies to achieve the target state [8]. Later, the Programme for International Student Assessment (PISA) (2012) expanded this definition to include exploration, hypothesis formulation, planning, execution, monitoring, and collaborative dimensions [9], [10]. In Vietnam, research on problem-solving has developed rapidly, with numerous studies analyzing how to foster this competency through subject-based learning and integrated activities [11], [12], [13]. These works focus directly on fostering the competency of problem-solving for students in general and primary students in particular through subjects such as Maths, Vietnamese, Natural

and Social Sciences, History and Geography.

Alongside the competency of problem-solving, creativity is also one of the most vital competencies for individuals to generate novel and valuable ideas or solutions. Vietnamese researchers define creativity as the ability to think independently, explore possibilities, and produce meaningful innovations in learning and life [14], [15], [16], [17], [18], [19]. Based on the research findings presented, it is evident that the competency of creativity is approached from various perspectives, yet all emphasize its importance as a competency that reflects an individual's ability to create something new and valuable in the processes of learning, working, and living. Studies recognized that the competency of creativity is not only about generating new ideas but also encompasses the ability to solve problems in novel, effective ways, tied to the creation of practical products or solutions. In particular, the competency of creativity is seen as a combination of independent thinking, exploratory ability, motivation, creative willpower, and a foundation of knowledge, skills, and personal qualities.

Theoretical analyses show that problem-solving and creativity are interrelated and mutually reinforcing competencies. Problem-solving provides the cognitive structure for identifying, analyzing, and addressing challenges, whereas creativity provides the divergent thinking and motivation to produce original and effective solutions. The integration of problem-solving and creativity results in a process of critical and creative thinking that enables learners to recognize problems, propose novel ideas, and implement practical solutions. Van Hooijdonk et al, (2023) demonstrated that primary-age students' creative problem-solving behaviours follow four iterative stages: understanding the challenge, generating ideas, preparing for action, and planning the approach; and that these behaviours are positively associated with divergent thinking and academic achievement. The study also underscored that open and collaborative learning structures—such as station rotation or project-based tasks provide effective conditions for nurturing students' ability to identify problems, generate ideas, and reflect creatively within competency-based primary education. [20]. Following the 2018 GEP, several Vietnamese studies conceptualized the competency of problem-solving and creativity as the learner's ability to mobilize knowledge, skills, attitudes, and emotions to analyze situations, propose measures, choose and implement solutions, and flexibly adjust them in new contexts [21], [22], [23]. This competency manifests through both cognitive and behavioral indicators: recognizing problems, generating ideas, evaluating solutions, and applying them creatively.

For primary school students, developing problem-solving and creativity competency means nurturing curiosity, independent thinking, and the capacity to apply learning to real-life situations. Research on the competency of problem-solving and creativity has been extensive, with scholars sharing a relatively consistent perspective. Findings indicate that this competency represents a complex cognitive process through which learners generate and implement solutions to overcome challenges, forming the basis for innovation in learning and practice. Although most international and Vietnamese studies have examined problem-solving and creativity as separate constructs, there is consensus that the combined competency belongs to the category of general competencies, reflecting an individual's capacity to identify and analyze problems, explore alternative approaches, and develop effective solutions in open-ended situations. This process embodies critical thinking, collaboration, and the generation of novel ideas applicable to real-life contexts. Since the introduction of the 2018 GEP, Vietnamese researchers have increasingly emphasized problem-solving and creativity as a core competency to be developed through subjects and educational activities at school.

Thus, the competency of problem-solving and creativity in primary students can be defined as the ability to mobilize and integrate knowledge, skills, and personal attributes to address learning tasks, propose and implement solutions, and produce new ideas or outcomes without predetermined procedures. "The new" or "creative" is understood in relative terms, in relation to

students' current competencies and compared to their prior knowledge and experiences.

2.2.2. Enhancing the competency of problem-solving and creativity for primary students in Vietnam

Research on enhancing learners' competencies has been widely discussed since the 1990s and has become a prevailing trend in global education. In the 21st Century context, competency development is viewed as a central goal of education reform, emphasizing learners' ability to apply knowledge, skills, and attitudes flexibly and creatively in real-life situations rather than merely acquiring theoretical knowledge.

In Vietnam, since the issuance of Resolution No. 29-NQ/TW by the Central Committee of the Communist Party in 2013 on the fundamental and comprehensive reform of education and training, studies on developing competencies for students have garnered significant attention from various authors. These studies have contributed to clarifying theoretical foundations, principles, and orientations for developing learners' competencies, with a particular focus on fostering key general competencies such as problem-solving and creativity.

Trinh Le Thien et al, (2020) addressed methods to develop the competency of problem-solving and creativity for high school students, such as selecting appropriate teaching content, employing problem-solving-based teaching, group-based teaching, and designing creative exercises for students [24]. Pham Ha Giang (2022) emphasized that developing problem-solving and creativity competency requires shifting from knowledge transmission to the organization of learning activities that promote active, experiential, and self-directed learning. Teachers act as facilitators, while students explore, construct, and apply knowledge independently and creatively [25]. In addition, several master's theses have focused on Chemistry education at lower and upper secondary levels, proposing systems of exercise and assessment tools to develop and evaluate problem-solving and creativity competencies [26], [27], [28], [29]. However, most existing studies have focused on secondary or high school students, where cognitive abilities are relatively mature. Few studies have examined the early formation and development of the competency of problem-solving and creativity in primary students, characterized by intuitive, experiential learning and the need for guided exploration. However, there remains a lack of practical research identifying effective teaching processes and pedagogical models that can systematically foster this competency at the primary level.

In particular, the relationship between teaching organization methods and the enhancement of the competency of problem-solving and creativity has not been sufficiently explored. SBL, a process that engages learners through diverse, rotating, and task-based learning environments, has not yet been studied as a specific pedagogical process for nurturing this competency in primary students. Therefore, this study aims to address that research gap by analyzing how the process of SBL can facilitate the formation and development of problem-solving and creativity competencies in primary education.

2.3. The relationship between Station-based Learning and the enhancement of the competency of problem-solving and creativity for primary students in Vietnam

SBL is a structured process in which students rotate through different learning stations, each providing learning tasks that require exploration, reasoning, and creative application. This process enhances the competency of problem-solving and creativity by engaging students in diverse learning contexts, encouraging flexible thinking, and fostering collaboration. Oktarianto et al. (2024) found that applying a station-rotation model significantly enhanced primary students' critical thinking and literacy skills, demonstrating the model's potential for fostering higher-order thinking in elementary classrooms. Moreover, students' self-efficacy was positively correlated with their gains in these competencies, indicating that confidence and autonomy play key roles in maximizing learning outcomes within station-based environments [30]. The relationship between

the SBL process and the enhancement of this competency can be explained through several interrelated mechanisms.

First, SBL creates problem-oriented learning situations that require primary students to identify and address problems through observation, reasoning, and experimentation. Each learning station can place students in a different context, requiring them to observe, reason, and devise appropriate solutions. By engaging with varied learning situations, students practice transferring strategies, adapting prior knowledge, and developing flexible and original approaches to problem-solving.

Second, rotation among stations exposes primary students to varied learning formats and modalities, encouraging divergent thinking and adaptability. At each station, tasks differ in method and form, ranging from hands-on experiments to discussions and product creation. This variation helps learners generate multiple perspectives and creative solutions, instead of relying on fixed procedures.

Third, the process promotes social interaction and collaborative inquiry, as students often work in small groups to exchange ideas and negotiate shared understanding. Through discussion or joint experimentation, learners articulate reasoning, justify solutions, and integrate diverse viewpoints. These interactions strengthen critical thinking and stimulate creative synthesis, aligning with the SBL process.

Fourth, SBL fosters iterative experimentation and reflection. Instead of providing a single answer, students can test multiple methods, compare results, and draw lessons. This iterative process deepens their understanding of the problem and encourages them to experiment with new ideas without fear.

Fifth, SBL encourages students to take an active role in their learning process, as they can choose their working methods and manage their time. This fosters independent thinking, cultivates the habit of asking questions, and develops creative problem-solving skills.

In summary, the process of SBL enhances the competency of problem-solving and creativity in primary students through the interaction among its structural components (including objectives, content, methods, tools, organization forms, and assessment). These components jointly activate cognitive and creative mechanisms such as exploration, analysis, ideation, implementation, and reflection. This theoretical linkage explains how the SBL process contributes to enhancing the competency of problem-solving and creativity in primary learners.

2.4. Some orientations for enhancing competency of problem-solving and creativity through SBL for primary students in Vietnam

SBL is a flexibly organized process that allows students to engage in diverse tasks, interact with peers, utilize various learning resources, and thereby develop the competency of problem-solving and creativity. In the current context of primary education, with the requirement to develop qualities and competencies as outlined in the 2018 General Education Program, the application of SBL needs to be specifically oriented to ensure both the effectiveness of teaching activities and a direct focus on the goal of developing the competency of problem-solving and creativity for students. The orientations are grounded in the theoretical relationship between the SBL process and the enhancement of competency of problem-solving and creativity. Each orientation corresponds to one or more structural components of the SBL process and aims to translate knowledge and skills into classroom practice.

Teachers should clearly define the objectives of SBL that integrate the competency of problem-solving and creativity. This is based on the premise that objectives determine the direction and expected outcomes of the learning process. When objectives explicitly reflect problem identification, idea generation, and creative application, they guide both teachers and students toward competency-based learning goals. Therefore, teachers need to redesign learning

outcomes not only in terms of knowledge but also in terms of how students can think critically, act independently, and create new products or solutions.

The content and tasks at stations should also be designed in an open-ended manner, encouraging students to ask questions, identify problems, and propose solutions. This orientation derives from the exploration and contextual learning emphasized in the SBL process. Therefore, the system of exercises and activities should be constructed based on real-life situations, reflecting core knowledge content while providing opportunities for students to pose questions, identify problems, and proactively suggest solutions to maximize students' critical thinking and creativity.

Moreover, teaching methods and forms must promote active learning, collaboration, and reflection. Based on the mechanism of analysis and ideation, teachers should combine interactive methods such as problem-solving, discussion, role-play, and project-based tasks, etc. Group activities encourage students to articulate reasoning, compare viewpoints, and co-construct creative solutions, while individual tasks foster autonomy and self-regulation. The flexible alternation between individual and group learning forms helps maintain both independence and cooperation, which are critical for nurturing the competency of problem-solving and creativity. Group debates not only strengthen students' reasoning and ability to defend their views but also push them to seek additional evidence and propose alternative solutions, which are core elements of creativity. Tools and learning materials should be diversified and designed to stimulate cognitive engagement and creativity. This recommendation is linked to the scaffolding and experimentation in the SBL process. When students are provided with varied, interactive tools, they can explore problems through multiple modalities, test hypotheses, and refine their understanding through hands-on practice.

Finally, assessment in SBL should focus on competency-based evaluation, emphasizing the process, learning products, and particularly students' ability to identify problems and propose creative solutions. This is grounded in the reflection within the theoretical framework. Assessment in SBL highlights students' learning process, tracking how they seek information, analyze data, and collaborate with peers to devise optimal solutions. Formative and summative assessments allow teachers to provide timely feedback, while self- and peer-assessments encourage students to reflect on their progress, evaluate strategies, and adjust approaches. Rubrics for assessment of the competency of problem-solving and creativity should be created to ensure that students develop this competency through SBL activities.

In conclusion, the proposed orientations are grounded in the theoretical base of the SBL process. When the components of the SBL process are coherently activated, they directly foster the competency of problem-solving and creativity in primary students. Thus, these orientations not only provide a scientific foundation for applying SBL but also serve as practical guidelines for implementing competency-based education in Vietnamese primary schools.

3. Conclusions

In conclusion, if SBL is organized rationally and closely aligned to enhance the competency of problem-solving and creativity, it will undoubtedly become an effective process to shift primary education in Vietnam from traditional knowledge transmission to substantive and sustainable competency-based education. By designing open-ended and contextualized learning tasks that encourage students to ask questions, identify problems, and propose creative solutions, teachers help learners apply knowledge flexibly, think critically, and solve problems. The process requires a balanced integration of individual and collaborative activities, where teachers act as facilitators providing timely feedback and scaffolding while maintaining space for independent inquiry. Assessment should emphasize process-based evaluation focusing on students' ability to identify problems, generate ideas, and implement creative solutions. To develop the effectiveness of SBL to enhance the competency of problem-solving and creativity, it should be integrated into

the school's educational plan and leverage available resources to enrich learning experiences, stimulate creative thinking, and foster problem-solving abilities in the real-life context of primary students.

REFERENCES

[1] Ministry of Education and Training, (2018). *General Education Program*, Issued with Circular No. 32/2018/TT-BGDĐT, dated December 26, 2018, by the Minister of Education and Training (Vietnamese).

[2] Vygotsky LS, (2004). Imagination and creativity in childhood. *Journal of Russian & East European Psychology*, *42*(1), 7-97.

[3] Aydogmus M, Senturk C, (2019). The effect of learning stations technique on academic achievement: A meta-analytic study. *Research in Pedagogy*, 9(1), 1-15

[4] Ocak G, (2010). The effect of learning stations on the level of academic success and retention of elementary school students. *The New Educational Review,* 21(2), 146-156.

[5] Kingnore B, (2011). *Tiered Learning Stations in Minutes! Increasing Achievement*, High-Level Thinking, and the Joy of Learning, TX: Professional Associates Publishing, ISBN 0-9787042-7-4

[6] Breckler J & Azzam A, (2011). The basic science learning station: an innovative kinesthetic learning approach in one medical school. *Med Sci Educator*, *19*, 72-79.

[7] Gyeltshen N & Dorji K, (2022). Learning Station Approach for Teaching Genetics in Grade ten in Tendu Central School, Bhutan. *International Journal of Chemical and Applied Biological Sciences*, 3(3). 21-31.

[8] Newell A & Simon HA, (1972). *Human Problem Solving*, (Vol. 104, No. 9). Englewood Cliffs, NJ: Prentice-hall.

[9] OECD (2010), *PISA 2012 Field Trial - Problem Solving Framework* (Draft Subject to Possible Revision After the Field Trial.

[10] OECD (2013), PISA 2015 - Draft Collaborative Problem Solving Framework, March 2013.

[11] Nguyen TN & Le XT, (2020). Developing the competency of problem-solving and creativity for students through teaching the topic "Automatic Water Pump" in lower secondary schools using the STEM education model. *Vietnam Journal of Education Sciences*, No. 32. (Vietnamesse).

[12] Nguyen TLP & Nguyen L, (2016). Methods and Techniques for Developing Assessment Standards for Reading Comprehension and Problem-Solving Competencies. Vietnam Education Publishing House, (Vietnamesse).

[13] Dinh T &Le KL, (2019). Applying project-based learning in teaching Silicon and its compounds to develop problem-solving competencies for high school students. *Education Journal*, Special Issue December, 187-191, (Vietnamesse).

[14] Huynh VS, (2009). *Psychology of Creativity*. Vietnam Education Publishing House, Hanoi, 129, (Vietnamesse).

[15] Tran VD, (2013). Some thoughts on creative competency and directions for promoting the creative competency of Vietnamese people today. *Science Journal*, Ho Chi Minh City University of Education, 49, 160-169, (Vietnamesse).

[16] Pham TBD, (2015). *Developing creative competency for students in teaching advanced organic chemistry in high schools*. Doctoral dissertation in Education, Hanoi National University of Education, (Vietnamesse).

[17] Nguyen THV, (2017). Determining the structure and development path of certain competencies in the Literature subject in schools. *Vietnam Journal of Education Sciences*, no. 137, 49-52, (Vietnamesse).

[18] Nguyen TTN, (2019). The structure of students' creative competency in literary text comprehension. *Vietnam Journal of Education Sciences*, No. 13, pp. 66-70, (Vietnamesse).

[19] Nguyen THL, (2020). Open-ended questions and students' creative competency in the Literature subject in high schools. *Vietnam Journal of Education Sciences*, No. 35, pp. 29-34, (Vietnamesse).

[20] Hooijdonk MV, Mainhard T, Kroesbergen EH & Tartwijk JV, (2023). Creative problem solving in primary school students, *Learning and Instruction*, vol. 88, 101823, https://doi: 10.1016/j.learninstruc.2023.101823.

[21] Tran TH & Nguyen DD, (2018). Developing problem-solving and creative competencies for students through exercises in the Nitrogen group chapter (Advanced Chemistry 11). *Education Journal*, Special Issue June, 194-199, (Vietnamesse).

[22] Nguyen TD, (2022). Developing problem-solving and creative competencies for students through teaching the Geography subject in lower secondary schools. *Education Journal*, 22(14), pp. 36-42, (Vietnamesse).

[23] Mai VBH & Tran DQH, (2024). The current situation of developing problem-solving and creativity competencies for grade-4 students in Science subject at several primary schools in Bien Hoa City, Dong Nai Province, *Journal of Science, Ho Chi Minh City University of Education*, 21(5), 48–53, https://doi.org/10.54607/hcmue.js.21.12.4525(2024).

[24] Trinh LT, Nguyen TPT, Dang TTA & Chu TH, (2020). Some measures to develop problem-solving and creative competencies for students through teaching organic chemistry topics in Grade 11 under the 2018 General Education Curriculum for Chemistry. *Science Journal*, University of Education, University of Hue, ISSN 1859-1612, No. 2(54)/2020, 46-56, (Vietnamesse).

[25] Pham HG, (2022). *Teaching Technology for Grade 6 with a focus on developing problem-solving and creative competencies*. Master's thesis in Education Sciences, (Vietnamesse).

[26] Tran TTT, (2020). *Developing problem-solving and creative competencies for students through a system of exercises in the Oxygen group chapter (Advanced Chemistry 10).* Master's thesis in Education Sciences, (Vietnamesse).

[27] Vu TP, (2020). *Developing problem-solving and creative competencies for students through teaching the inorganic chemistry section in Grade 11 using the STEM approach.* Master's thesis in Education Sciences, (Vietnamesse).

[28] Tran TH, (2019). *Developing problem-solving and creative competencies for students through a system of practical-content exercises in the chapter on Alkaline earth metals, Alkaline earth metals, and Aluminium (Chemistry 12).* Master's thesis in Education Sciences, (Vietnamesse).

[29] Pham TN, (2020). Developing problem-solving and creative competencies for students through teaching Chapter 3 (Chemistry 9). Master's thesis in Education Sciences, (Vietnamesse).

[30] Oktarianto ML, Hidayat A, Gofur A & Dasna IW, (2024). Exploring the role of self-efficacy in station rotation: enhancing critical thinking and literacy skills among primary learners, *Psychological Science and Education*, 29(3), 160-181, https://doi: 10.17759/pse.2024290310.