



A Proposed Process Framework for Developing the Competencies of Primary School Teachers in Facilitating Game-Based Learning Oriented Towards Education for Sustainable Development

Nguyen Minh Giam¹, Pham Thi Trang²

¹Faculty of Education, Thu Dau Mot University, Ho Chi Minh City, Vietnam

²Luong The Vinh Primary School, Thuan An Ward, Ho Chi Minh City, Vietnam

ABSTRACT: Education for Sustainable Development (ESD) through Game-Based Learning (GBL) is a highly effective pedagogical approach, creating a simulation space that helps primary school students experience and solve practical problems. However, through a review of international literature, the article points out a paradox: although teachers support GBL, the lack of games literacy and design skills makes them passively reuse available games on gaming platforms. In order to thoroughly address this gap, the study proposes a strategic shift in training towards Learning by Design and Mentoring. The core contribution of this article is a practical 4-stage professional development process framework: Activating and enhancing game awareness, Game design and creation, Honing pedagogical and reflective skills, and Practical implementation and mentoring. This is a standardized roadmap that helps educational institutions confidently transform their teaching staff from users into designers of sustainable educational environments.

KEYWORDS: Game-Based Learning, Education for Sustainable Development, Primary teacher competencies, Games literacy, Professional development process framework, Learning by Design.

1. INTRODUCTION

Education for Sustainable Development (ESD) is currently a central global objective, requiring primary school students to develop the critical thinking necessary to address complex environmental, social, and economic challenges. To meet this demand, Game-Based Learning (GBL) has been affirmed as a highly effective pedagogical approach. Moving beyond mere entertainment, games create a safe simulation space where students do not absorb information passively; instead, they must directly make decisions, solve problems, and take responsibility for the consequences of their actions on the community. Concurrently, game models such as microgames or hybrid (physical-digital) games have proven effective in flexibly integrating the Sustainable Development Goals (SDGs) into academic subjects. However, this immense potential cannot be fully realized without the decisive, guiding role of the teacher. To translate abstract ESD goals into tangible learning experiences, teachers must master "games literacy," which requires a seamless integration of four domains of competence: pedagogical, technological, collaborative, and creative. Nevertheless, practical implementation faces significant barriers: although teachers show strong support for this method, they frequently lack confidence due to limitations in practical design skills. Consequently, the majority of teachers tend to be passive, merely reusing available entertainment games rather than proactively designing new learning spaces aligned with sustainable values. This reality highlights that the core bottleneck is not a lack of technological tools, but rather the absence of practical professional development models that shift the focus from theoretical learning to Learning by Design and Mentoring. Driven by this urgency, this article, titled "A Proposed Process Framework for Developing the Competencies of Primary School Teachers in Facilitating Game-Based Learning Oriented Towards Education for Sustainable Development," was conducted. Through a systematic review of international literature, the study aims to clarify the core structure of teacher competencies, while simultaneously contributing a highly practical 4-step professional development process framework. This framework will serve as a standardized operational roadmap, enabling educational institutions to transform teachers from mere users into designers of learning environments, thus meeting the demands of modern educational innovation.



2. RESEARCH RESULTS

2.1. Characteristics and roles of games in Education for Sustainable Development (ESD) Unlike traditional teaching methods, the use of Game-Based Learning (GBL) in Education for Sustainable Development (ESD) does not merely stop at entertainment or the simple transmission of knowledge. Based on the analysis of international research, games in this context possess the following specific characteristics and roles:

First, creating a problem-solving-oriented simulation space: The most prominent characteristic of ESD-oriented games is their ability to create a "simulation space" closely linked to real-world contexts. According to the comprehensive studies by Resti et al. (2024) and Senka et al. (2024), the game space opens up hypothetical situations where students do not passively receive information; instead, they must directly participate in thinking, making choices, and taking responsibility for the consequences of their actions on society and the environment. In particular, Tsai et al. (2021) describe board games as a miniature society. Here, the operating rules allow students to experience the process of "trial - error - adjustment" in a safe environment, thereby accumulating experience to apply in practice.

Second, interdisciplinary integration associated with the Sustainable Development Goals (SDGs): Education for Sustainable Development is inherently multidimensional; therefore, games also require content that transcends the boundaries of a single subject. Jhang et al. (2025) and Saimon et al. (2024) have demonstrated that game models (ranging from hybrid digital-physical games to microgames) are excellent tools for integrating the Sustainable Development Goals (SDGs) into primary schools. For instance, a microgame can be directly integrated into subjects such as Mathematics, Language, or Arts to address a specific environmental issue, helping students approach complex topics (economic - social - environmental) in a highly clear and interdisciplinary manner.

Third, promoting systems thinking and improving learning motivation: Integrating game mechanics into teaching plays a key role in translating awareness into action. Senka et al. (2024) emphasize that through games, students begin to develop systems thinking as they are forced to constantly weigh and trade off between individual behavioral benefits and the common good of the community. Furthermore, empirical results from Resti et al. (2024) and Jhang et al. (2025) show that games significantly improve the level of engagement and learning interest. This method opens up a dynamic interactive environment, making it easier for students to absorb abstract concepts or those traditionally considered dry in the field of sustainable education.

2.2. The structure of primary school teachers' competencies in facilitating games

To maximize the potential of Game-Based Learning (GBL) in Education for Sustainable Development (ESD), teachers cannot merely remain in the role of traditional classroom managers. Analyses from international literature indicate that the competency to use games is a complex system of knowledge and skills. Chen et al. (2020) conceptualized this system under the term "games literacy," comprising five foundational domains: basic game knowledge, advanced game knowledge, instructional design, organization and management, and assessment of learning outcomes.

Concurring with this multidimensional perspective, studies by Nousiainen et al. (2018) and Rulyansah et al. (2023) define the structure of teachers' competencies when employing game-based pedagogy as being shaped by four core domains: Pedagogy, Technology, Collaboration, and Creativity. In particular, creative competence requires teachers to possess a positive attitude, a readiness to explore, enthusiasm, and an acceptance of trial-and-error experimentation alongside their students. When applying these four domains to practical classroom facilitation, the structure of teacher competencies is manifested throughout three pedagogical stages proposed by Bado (2022) and Hayak & Avidov-Ungar (2023):

First, design and planning competence (Pre-game stage): This is the foundational competence, demonstrated through the teacher's strategic planning ability. Hayak & Avidov-Ungar (2023) point out that teachers need to master a 5-step process: identifying objectives, selecting games, designing activities, implementing, and assessing. Specifically for the ESD field, design competence demands much more rigorous requirements. According to Senka et al. (2024) and Afzaal & Munir (2025), teachers must deeply understand environmental, economic, and social issues, thereby concretizing abstract sustainable development goals into specific game rules and tasks within a simulation space.

Second, organization, facilitation, and troubleshooting competencies (During-game stage): The effectiveness of a game depends entirely on how the teacher acts as a facilitator (Molin, 2017). During gameplay, the teacher's pedagogical and technological competencies must be seamlessly integrated. According to Rulyansah et al. (2023), teachers must simultaneously guide, maintain the pace, and manage student behavior, while also possessing the keen ability to address unexpected technology-related obstacles

(such as connection errors, device failures, or gameplay glitches) without disrupting students' emotional engagement in learning. Bado (2022) also notes that facilitation competence requires teachers to know when to step back so that students can take ownership of the game, and when to intervene to redirect their attention back to the lesson objectives.

Third, assessment and reflection competencies (Post-game stage): This is considered the most crucial competence that distinguishes an educational game from a purely entertainment game. After the game concludes, teachers must possess the skills to organize discussions and debriefing to help students connect the hypothetical experiences in the game with real-world academic issues (Bado, 2022). Furthermore, the assessment of student competencies must also be flexible. Chen et al. (2020) and Aykaç & Köğçe (2019) emphasize that teachers must know how to design formative assessment strategies based on students' behaviors, interactions, and decisions during the game, rather than merely grading the final outcome.

To maintain long-term effectiveness, teachers also need self-reflection competence. Shah & Foster (2015) propose using the Game Network Analysis framework to help teachers re-evaluate the game structure and its pedagogical value, as well as to consider classroom contextual factors in order to continuously adjust and improve subsequent learning activities.

2.3. The process framework for developing competencies in facilitating Game-Based Learning oriented towards Education for Sustainable Development

The professional development program, titled "*Designer Teachers: Games and Sustainable Development*," is implemented over four sessions, each lasting four hours. It is based on two primary approaches: Learning by Design (where teachers design games themselves to gain a deeper understanding) and Mentoring (involving support and guidance from experts and peers). The program is structured into four distinct, step-by-step stages, enabling primary school teachers to master the skills of facilitating games in teaching oriented towards Education for Sustainable Development (ESD). The detailed process is as follows:

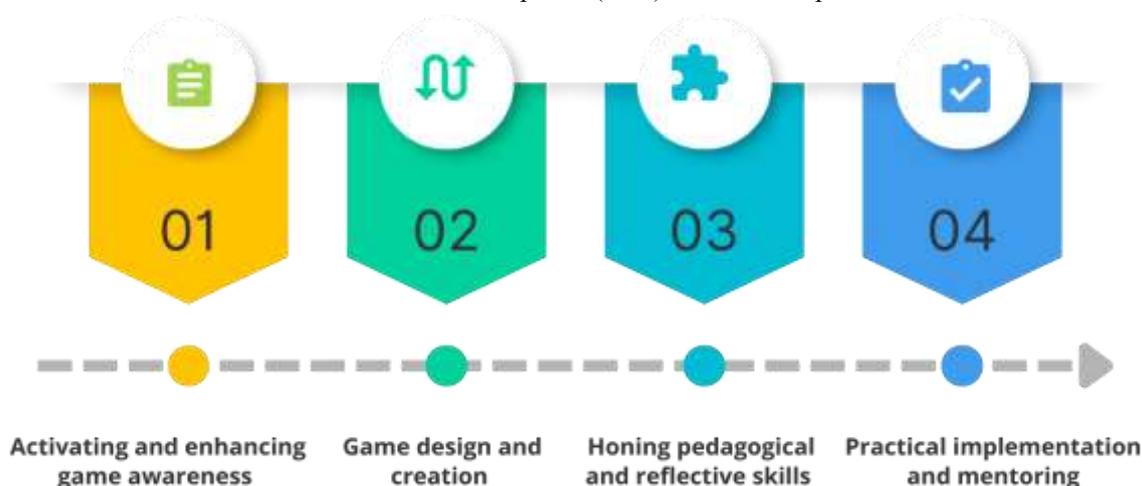


Figure 1. The process framework for developing competencies in facilitating Game-Based Learning oriented towards Education for Sustainable Development

Stage 1 – Session 1: Activating and enhancing game awareness

The primary objective is to help teachers shift their perception: games are not merely for entertainment or warm-up activities, but are highly effective educational tools, particularly when integrating sustainable development.

Step 1: Teachers directly participate in playing a sample ESD game (e.g., a game on waste sorting or water conservation).

Step 2: Analyzing the played game: Experts guide teachers in answering questions such as "*Where is the environmental protection objective integrated?*" and "*Which rules force players to weigh and trade off between individual benefits and the common good?*"

This step helps teachers identify the core elements of an ESD game: where sustainable goals are embedded, which rules create a trade-off between individual benefits and the common good, how the consequences of actions reflect reality, and how the game fosters collaboration and creativity. Through this, teachers develop their game analysis skills and recognize that the game is a miniature society that prompts primary school students to think critically, make decisions, and take responsibility.



Step 3: Introducing basic theory: A game is a miniature society where students undergo experiences to learn how to think, make decisions, and take responsibility for the consequences corresponding to their behaviors, aligning with the requirements of comprehensive human development.

Step 4: Preliminary assessment and homework assignment: A short group discussion (30 minutes) on how to apply games to specific lessons, along with requiring teachers to keep a reflective journal in preparation for the subsequent stage, thereby ensuring the continuity of the action research activities.

Stage 2 – Session 2: Game design and creation

The objective is to develop creative and technological skills, helping teachers overcome the habit of merely downloading available games without any editing, building, or creating.

Step 1: Each group selects a specific lesson (from the core curriculum) that can integrate ESD, clearly identifying the knowledge to be taught and the sustainability message (e.g., water conservation, forest protection) to build the game. In this step, teachers are provided with supplementary skills in image and video design using free editing tools and artificial intelligence (AI) platforms.

Step 2: Selecting an appropriate game development platform: Teachers are guided to choose flexible game formats, ranging from simple digital platforms such as Quizizz, Kahoot, PowerPoint, and Wayground, with a priority on microgames (5-10 minutes) for easy integration into core lessons. This step helps overcome technology-related obstacles and time constraints, while ensuring that the games are appropriate for the psychophysiological characteristics of primary school students (aged 6-11), thereby promoting active participation and the formation of sustainable competencies.

Step 3: Establishing game rules so that academic content is seamlessly and naturally integrated with environmental themes (e.g., in Mathematics or Natural Sciences, students calculate a tree-planting budget to protect the environment).

Step 4: Finalizing and submitting the game-integrated lesson plan designed by the group.

Step 5: Checking alignment with ESD: Teachers self-assess their products using a checklist (e.g., "Does the game promote a sense of social responsibility?"), based on the standards and metrics prescribed by ESD, in order to reinforce the teacher's role in fostering sustainable education.

Stage 3 – Session 3: Honing pedagogical and reflective skills

The objective focuses on how to effectively organize and facilitate games, particularly the post-game discussion (debriefing)—this is a crucial stage but is often overlooked.

Utilizing the simulation teaching method ensures that teachers not only grasp the theory but can also "do it" immediately, ready to apply ESD games in actual classrooms effectively and sustainably, combined with the role-playing teaching method.

Step 1: Training on the 3-part process:

Pre-game: Clearly explaining the rules, game mechanics, and the game's objectives linked to ESD.

During-game: Maintaining discipline, providing technical support, and observing students' behaviors and their play-learn process.

Post-game: Organizing in-depth discussions (debriefing) to help transform the playful experience into sustainable lessons, ensuring that primary school students not only play but also understand and apply ESD knowledge to real life. The primary objective is to connect the game with reality, helping primary school students reflect on their emotions and game outcomes, and draw profound lessons about sustainable development.

Step 2: Practicing asking reflective questions by level. This is a core step that helps primary school teachers practice the skill of organizing in-depth discussions after playing ESD games, ensuring students not only have fun but also draw sustainable lessons. The main objective is to help teachers master how to ask reflective questions at two distinct levels: the emotion/outcome level (for students to express their feelings) and the real-world connection level (to relate the game to real life and sustainable behaviors).

Level 1 (emotions and outcomes): Why did your team win? What made your team get the most points? How did you collaborate with each other?

Level 2 (real-world connections): If we overexploit resources in real life like in the game, what will be the consequences? When choosing to recycle instead of throwing things away quickly, what did you learn about environmental protection? What will you do at home to help make the Earth cleaner?

Step 3: Experts and peers provide direct feedback on questioning techniques, handling noisy classrooms, and overall classroom management skills.



Step 4: Small-scale trial application: Teachers select a reflective question to test with a small group, keeping a reflective journal to assess the impact on students' sustainability awareness, based on the Sustainable Development Goals (SDGs).

Stage 4 – Session 4: Practical implementation and mentoring

The objective of this stage is to translate knowledge into sustainable action, while fostering long-term support among teachers, contributing to improving the quality of primary education and fulfilling the goal of comprehensive human development. This stage ensures the sustainability of the program, aligning with the requirements of building an equitable, inclusive educational environment and promoting lifelong learning.

Step 1: Selecting 2 to 3 core participants (with strong information technology and pedagogical skills, or knowledge of educational technology) to act as a nucleus supporting other teachers in the classroom.

Step 2: All other teachers organize actual lessons using their designed games. The core participants and experts observe the classes, providing immediate and on-the-spot support (resolving technology-related obstacles, advising on methods and content) without assessing through grades or scores.

Step 3: Collecting and sharing all designed game products to the school's shared online resource repository. This helps reduce the preparation workload for subsequent years and encourages teachers to continue collaborating and sharing experiences.

Step 4: Comprehensive assessment and maintenance planning: Conducting surveys and assessments (measuring the improvement in competencies in facilitating game-based learning), interviewing teachers and students regarding the impact of ESD, and establishing a Facebook group to share experiences, knowledge, and skills through the monthly teaching process, ensuring long-term viability. This process framework is scientifically designed, from theory to practice, from the individual to the community, ensuring that teachers not only "know" but can also "do" and maintain it in the long term. This process is a continuous sequence of steps, serving as the key to helping primary school teachers become true "designers," enabling them to confidently use ESD games to make lessons more dynamic, relatable, and meaningful for children. From activating awareness, game design and creation, honing pedagogical skills to practical implementation, each stage is built logically and is easy to apply, based on the practical context of primary school classrooms and the global sustainable development goals. This affirms that when teachers master this process framework, they not only enhance their competencies in facilitating learning but also contribute to shaping a generation of students with environmental and social responsibility, ready to face the challenges of the future—a practical step forward for sustainable education.

3. CONCLUSION

Education for Sustainable Development does not merely transmit knowledge but also cultivates critical thinking and a sense of social responsibility. In this process, Game-Based Learning serves as an ideal simulation space for students to directly experience, solve problems, and recognize the consequences of their behaviors. However, a major paradox exists in practice: although teachers strongly support this pedagogical method, they lack games literacy and design skills. Consequently, they often lack confidence and fall into a passive state, primarily reusing available games on gaming platforms and websites rather than proactively designing new learning environments that embody sustainable values.

To thoroughly address this issue, the article has proposed a highly practical 4-stage professional development process framework: Activating and enhancing game awareness, Game design and creation, Honing pedagogical and reflective skills, and Practical implementation and mentoring. This process framework marks a strategic shift: from traditional theoretical training models to a Learning by Design orientation. This serves as a standardized operational roadmap, enabling educational institutions to flexibly apply it to confidently transform their teaching staff from users of games into designers of learning experiences, enhancing the competencies of primary school teachers in using games in teaching oriented towards Education for Sustainable Development, ready to meet the innovative challenges of global education.

REFERENCES

1. Afzaal, S., & Munir, H. (2025). An Analysis of Teachers' Competencies for the Implementation of Education for Sustainable Development (ESD) at Primary Level: A Mixed Method Approach Observational Study. *Regional Lens*, 4(3), 135-143.



2. Aykaç, M., & Köğce, D. (2019). Preservice Classroom Teachers' Opinions on Use of Educational Games in Instructions of Primary School Courses. *Educational Policy Analysis and Strategic Research*, 14(1), 116-143.
3. Bado, N. (2022). Game-based learning pedagogy: A review of the literature. *Interactive Learning Environments*, 30(5), 936-948.
4. Chen, S., Zhang, S., Qi, G. Y., & Yang, J. (2020). Games literacy for teacher education. *Educational Technology & Society*, 23(2), 77-92.
5. Hayak, M., & Avidov-Ungar, O. (2023). Knowledge and planning among teachers integrating digital game-based learning into elementary school classrooms. *Technology, Pedagogy and Education*, 32(2), 239-255.
6. Jhang, J. N., Lin, Y. C., & Lin, Y. T. (2025). A Study on the Effectiveness of a Hybrid Digital-Physical Board Game Incorporating the Sustainable Development Goals in Elementary School Sustainability Education. *Sustainability*, 17(15), 6775.
7. Molin, G. (2017). The role of the teacher in game-based learning: A review and outlook. *Serious Games and Edutainment Applications*, Volume II, 649-674.
8. Nousiainen, T., Kangas, M., Rikala, J., & Vesisenaho, M. (2018). Teacher competencies in game-based pedagogy. *Teaching and teacher education*, 74, 85-97.
9. Resti, N., Purwianingsih, W., & Kusnadi, K. (2024). Facilitating Students' Understanding of Sustainable Development through Game Based Learning: A Systematic. *Studies on Social and Education Sciences 2024*, 1.
10. Rulyansah, A., Ghufon, S., & Mariati, P. (2023). Competencies of Teachers in Game-Based Pedagogy. *Pegem Journal of Education and Instruction*, 13(2), 354-370.
11. Saimon, M., Lavicza, Z., Houghton, T., & Rahmadi, I. (2024). A model for integrating microgames in teaching primary education for sustainable development. *Journal of Research in Innovative Teaching & Learning*, 17(3), 448-458.
12. Senka, G., Tramonti, M., Dochshanov, A. M., Jesmin, T., Terasmaa, J., Tsalapatas, H., ... & Vaz de Carvalho, C. (2024). Using a game to educate about sustainable development. *Multimodal Technologies and Interaction*, 8(11), 96.
13. Shah, M., & Foster, A. (2015). Developing and assessing teachers' knowledge of game-based learning. *Journal of Technology and Teacher Education*, 23(2), 241-267.
14. Tsai, J. C., Liu, S. Y., Chang, C. Y., & Chen, S. Y. (2021). Using a Board Game to Teach about Sustainable Development. *Sustainability* 2021, 13, 4942.

Cite this Article: Giam, N.M., Trang, P.T. (2026). A Proposed Process Framework for Developing the Competencies of Primary School Teachers in Facilitating Game-Based Learning Oriented Towards Education for Sustainable Development. International Journal of Current Science Research and Review, 9(2), pp. 960-965. DOI: <https://doi.org/10.47191/ijcsrr/V9-i2-40>