Beyond Knowing: Fostering Future-Ready Competencies Through Inquiry-Based Gamified Learning

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ABSTRACT

The future of education requires a paradigm shift from the current practices of knowledge transmission to learning approaches that prepare students to deal with complexity and uncertainty. Future-ready education promotes competencies such as higher-order thinking skills, creativity, communication, collaboration, problem-solving, adaptability, and applying knowledge in the classroom and beyond. Competency-based learning represents an innovative educational orientation that fosters learning achievements based on demonstrated proficiencies and mastery of certain skills, competencies, and proficiencies.

Within this framework, this paper aims to explore and assess how Inquiry-Based Gamified Learning (IBGL) could support future-oriented learning and help schools nurture future-ready competencies. The paper focuses on gamification as an approach to learning that incorporates game-design elements and principles to engage and motivate students in the learning process. As such, the paper discusses how gamification could be integrated into inquiry-based learning, which emphasizes higher-order cognitive skills such as questioning, researching, reasoning, constructing meaning, and accessing information to find solutions to real-world problems.

The paper further explores the alignment of inquiry-based gamified learning with competency-based education, particularly in relation to critical thinking, creativity, communication, and collaboration. It suggests that combining these pedagogical approaches can facilitate a shift from a narrow focus on content delivery towards competency-oriented learning. Through this integration, learners are given meaningful opportunities to apply their knowledge in relevant, real-life, and contextual situations.

The discussion highlights the pedagogical possibilities, theoretical foundations, and educational implications of inquiry-based gamification for preparing future-ready learners. The paper concludes by emphasizing the need to reimagine learning environments that move beyond knowing towards thinking, creating, communicating, collaborating, and applying knowledge.

Keywords: Future Skills; Competency-Based Learning; Inquiry-Based Learning; Gamification; Future-Ready Learners; Learning and Innovation Skills

INTRODUCTION

The current changes in education and its development trends in the context of emerging technologies, globalization, and workforce needs require rethinking the ways of training students. In addition to acquiring knowledge and competencies in a particular field of activity, students need to learn to adapt to new realities, collaborate, work, and communicate in an increasingly tech-savvy environment (Voogt et al., 2013).

Technological progress, artificial intelligence, digitalization, ecological crises, demographic changes, globalization, and the transformations of employment are drivers that not only affect the knowledge that needs to be learned but also the cognitive structures and behaviours of individuals. Learners now increasingly face

situations where solutions are not fixed, information is readily available, and existing knowledge may no longer be adequate as conditions continue to change. UNESCO's Futures of Education initiative similarly highlights the growing complexity and interconnectedness of contemporary challenges and calls for a reconsideration of the purposes, organization, and relationships of education.

This changing educational orientation reflects a broader understanding of competence, in which knowledge is mobilised alongside skills, attitudes, and values to address complex demands. Accordingly, the central concern of education extends beyond what learners know to include how they use knowledge, exercise judgement, collaborate with others, and act responsibly in uncertain situations. Such an orientation positions learners as active agents in their own development and in shaping the world around them, thereby signifying a transition from the acquisition of knowledge towards the formation of capable, reflective, and responsible persons.

The OECD Learning Compass 2030 reflects this transition by placing learner agency and competencies, including knowledge, skills, attitudes, and values, at the centre of a future-oriented educational vision. The metaphor of a compass emphasizes the capacity of learners to orient themselves and exercise purposeful and responsible action in unfamiliar situations rather than simply follow predetermined paths (OECD, 2019). India's National Education Policy 2020 similarly emphasizes holistic development, critical thinking, problem solving, creativity, communication, collaboration, and other higher-order capacities alongside foundational and disciplinary knowledge (Ministry of Education, 2020).

This changing view of education shows the importance of using teaching approaches that help learners develop competencies through actual learning experiences, rather than simply listing them as expected outcomes. The combination of inquiry-based learning and gamification offers one such approach. Inquiry-based learning encourages students to ask questions, investigate issues, use reasoning, develop their own understanding, and reflect on what they have learned. Gamification can support this process by incorporating suitable game elements, such as challenges, feedback, progress levels, choices, and meaningful participation.

This paper, therefore, proposes Inquiry-Based Gamified Learning (IBGL) as a conceptual pedagogical model in which inquiry is foundational to learning and gamification is utilized to motivate and engage students, providing an environment conducive to continued inquiry and competency development beyond content acquisition. The paper is not suggesting that games inherently lead to competencies, but rather that the combination of these approaches would enable educational environments where students are driven to acquire knowledge and skills for their own sake and to become future-ready.

This paper adopts a conceptual and exploratory approach based on a review and synthesis of relevant literature, policy documents and educational frameworks related to competency-based education, inquiry-based learning, gamification and 21st-century competencies.

From Knowing to Becoming: The Changing Purpose of Education

The changing conditions of contemporary life have prompted a fundamental reshaping of what education should ultimately achieve. Although the acquisition of knowledge remains an essential foundation of learning, education can no longer be understood merely as the transmission and retention of established information. Its broader purpose is to help learners apply what they know, respond to unfamiliar situations, and participate responsibly in a changing society. This perspective marks a movement from knowing to becoming, as education increasingly focuses on the development of capable, reflective, adaptable, and socially responsible individuals.

This change is significant when knowledge is understood as a tool for thoughtful action rather than an end in itself. Learners need to use their knowledge to interpret action. They need to use their knowledge to interpret situations, solve problems, generate ideas, collaborate with others, and act accordingly. As a result, assessing the success of education should not be limited to measuring how much students learn. It must also go beyond traditional tests and include assessments of their ability to apply knowledge, think critically and creatively, communicate and collaborate effectively, reflect on their learning, and be flexible in the face of changing circumstances.

The changing purpose of education can be seen to involve a transition from an information transfer process to knowledge building, from learning answers to learning issues, and from preparing to meet the anticipated future to becoming capable of meeting an unpredictable future. Therefore, the change in the purpose of education does not necessarily mean turning away from knowledge, but rather moving from knowledge as an end to knowledge as a means and basis for human capabilities. Consequently, it is essential to develop educational methods that help learners engage in knowledge construction and practice, acquire competence, address significant issues, and apply knowledge in context. Thus, it can be concluded that the future focus of education involves more learning capabilities for doing what one needs to do and continues to develop through learning.

Inquiry-Based Learning: From Receiving Knowledge to Constructing Understanding

In modern learning practice, meaningful learning is frequently attributed to learners' curiosity, engagement, and active pursuit of ideas. IBL is a learning theory that prioritizes learners by encouraging them to participate in activities such as asking questions, conducting investigations, collecting data, reasoning, and proposing explanations. While inquiry-based learning (IBL) can be applied in all fields of education, it seems to be especially relevant in science, due to the fact that questioning, investigating, observing, experimenting, analyzing evidence, and proposing an explanation are the core principles of creating an understanding of the world in this field.

IBL is based on constructivist theories of learning which posit that learning is an active process wherein individuals construct their knowledge in the context of particular understanding through interaction with others and new phenomena (Piaget, 1972). According to Dewey (1938), experience, inquiry, and reflection are fundamental principles which underpin learning. Learning becomes highly meaningful and significant if learners interact with various phenomena through exploring, criticizing, and reflecting on them. In the process, inquiry plays a pivotal role in learning because it helps in bridging the "problem-situation" to "restructuring knowledge" as a way of reflecting or actualizing experience.

Within science education, IBL aims to engage the learners in such a way as to enable them to question, seek, receive, produce explanations, make cause and effect relations, undergo critical evaluation of evidence, and apply scientific knowledge and processes (Parim, 2009; Bianchini & Colburn, 2000). In this regard, teaching science through inquiry goes beyond simply focusing on the content or substance of science and emphasizes rather the learning of processes through which scientific knowledge is produced as learners are able to acquire responsibility for their own learning. In addition, the inquiring nature of IBL allows for cultivating such traits as lifelong learning, creativity, and higher-level problem-solving abilities (Branch & Solowan, 2003; Lawson, 2010). Research has also shown that inquiry-based learning helps students improve their grades, scientific skills, and critical thinking abilities compared to more traditional teacher-led styles (Köksal, 2008; Blanchard et al., 2010). Instead of the traditional classroom setting where students are passive listeners to their teachers, IBL allows a more interactive environment in which students can engage with each other in forming and analyzing knowledge (Llewellyn, 2002).

Importantly, inquiry is not a uniform instruction model but can take various levels or types based on the amount of control and responsibility given to students. For instance, inquiry can be 'structured,' where a teacher provides the problem or question, as well as procedures for solving it, or 'guided,' where students are given a statement or problem but have more responsibility for figuring out the solution procedures. Another type of inquiry is 'open,' which enables students to conduct research, ask questions, and develop explanations independently. Overall, teachers can use inquiry-based learning at different levels to meet students' needs, based on their interests, prior experience, objectives, and the level of detail provided by educators.

Thus, the importance of IBL in modern education is determined not only by its role as an alternative to the didactic model of the lesson but also by its ability to help solve an authentic cognitive puzzle. This, in turn, creates the basis for developing a student's ability to transform their learning: go from the initial state of not knowing and misunderstanding to the end state of understanding and knowledge. It is also worth noting that inquiry-based learning connects the shifting educational paradigm with competency-based education by positioning knowledge as the basis for building and expanding competencies and skills.

However, inquiry-based learning also presents a pedagogical consideration. Inquiry often requires learners to sustain attention and effort while investigating problems for which solutions are not immediately apparent. The uncertainty, complexity, and iterative nature of inquiry can therefore require appropriate motivational and experiential support. This creates a conceptual space for complementary approaches that can sustain learner participation without weakening the intellectual character of inquiry. Gamification provides one such possibility.

Gamification as a Complementary Architecture for Inquiry-Based Learning

While IBL provides the cognitive and investigative foundation for learners to question, explore, construct knowledge, and develop explanations, sustaining engagement throughout challenging inquiry processes can be a pedagogical consideration. Gamification can complement this process by introducing purposeful challenge, progression, feedback, choice, and interaction. Its relevance therefore lies not in replacing inquiry but in strengthening the conditions that can support learners' continued participation in inquiry-oriented learning. Gamification refers to the incorporation of selected game-design elements into non-game contexts (Deterding et al., 2011). In educational settings, gamification may incorporate features such as challenges, missions, levels, feedback, progress tracking, points, badges, narratives, learner choice, rewards, and shared collaborative objectives.

With the increasing integration of digital and mobile technologies into education, gamification and game-based learning have gained prominence as approaches for enhancing learner engagement and participation by incorporating game-related features that encourage desired behaviours and support learning outcomes (Zainuddin et al., 2020). However, educational gamification extends beyond simply adding game elements to conventional instructional activities. Its pedagogical value lies in designing learning experiences that encourage sustained participation, purposeful interaction, and active involvement in the learning process. Research has identified motivation and engagement as important areas of potential within gamified learning environments, although outcomes depend considerably on the design, context, and pedagogical grounding of the game elements used (Hakulinen et al., 2013; Kumar & Khurana, 2012; Li et al., 2012). This consideration is particularly relevant to inquiry-based learning because inquiry requires learners to persist through uncertainty, investigate alternatives, revise ideas, and sometimes experience failure before arriving at an explanation or solution. Appropriately designed challenges and feedback may provide learners with a structured sense of progress while maintaining their involvement in the learning process.

The motivational potential of gamification can be understood through Self-Determination Theory (SDT). Deci and Ryan (2000) identify autonomy, competence, and relatedness as fundamental psychological needs underlying high-quality motivation. Within an inquiry-based learning environment, these needs can potentially be supported through meaningful choices in investigation, progressive challenges and feedback that develop a sense of competence, and collaborative activities that promote relatedness. Gamification can therefore provide motivational conditions that encourage learners to take greater ownership of learning and persist when inquiry tasks become challenging.

Flow Theory offers another perspective on this relationship. Csikszentmihalyi (1990) proposed that deep involvement can occur when the level of challenge is appropriately balanced with an individual's developing abilities. In a gamified inquiry environment, challenges can be progressively structured from accessible tasks to more complex problems, while timely feedback helps learners recognize the consequences of their actions and adjust their strategies. Such design may support sustained engagement without reducing the intellectual demands of inquiry. The relationship between these two approaches can therefore be understood as complementary rather than additive. Inquiry provides the intellectual purpose of the learning experience, while gamification can provide an experiential structure that supports motivation and persistence. The convergence of the two approaches therefore creates a potential pathway from curiosity to investigation, investigation to knowledge construction, knowledge construction to competency practice, and competency practice to reflection and transfer. This conceptual convergence provides the foundation for the proposed Inquiry-Based Gamified Learning (IBGL) approach, which seeks to bring together the cognitive and investigative strengths of inquiry with the motivational and experiential affordances of gamification.

From Convergence to Integration: Conceptualizing Inquiry-Based Gamified Learning

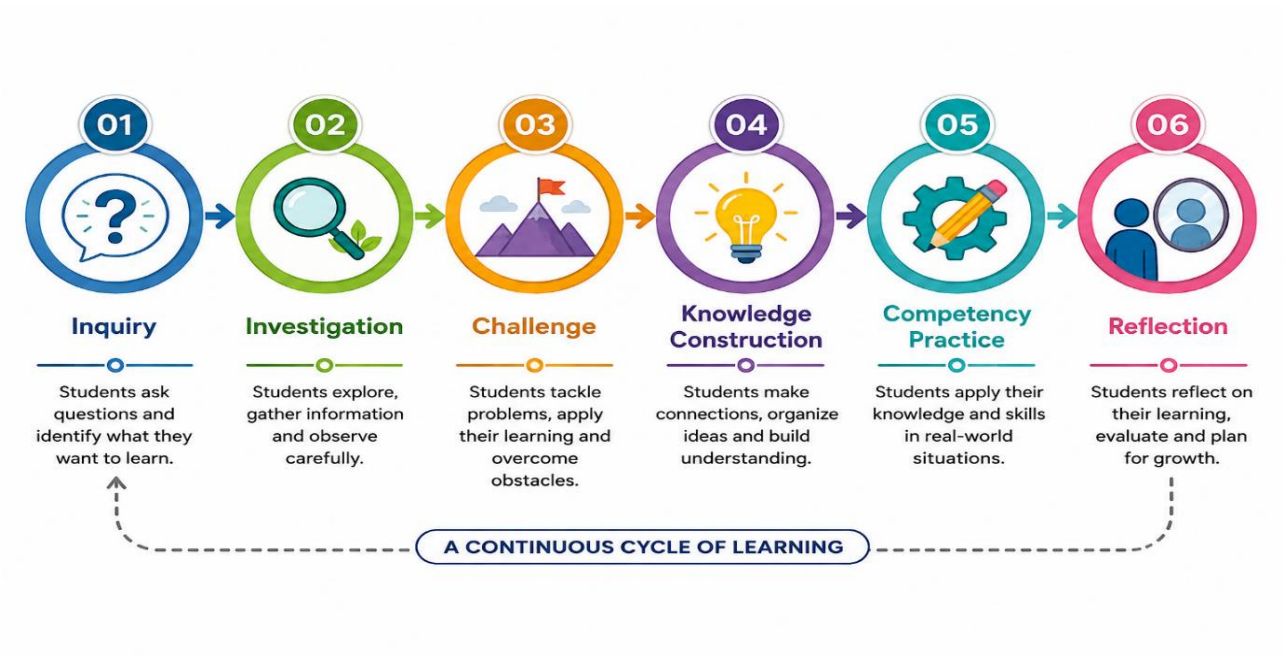
Building on the complementary relationship between inquiry and gamification, Inquiry-Based Gamified Learning (IBGL) is conceptualized as a learner-centred pedagogical approach that integrates inquiry processes with purposeful game-design elements to support knowledge construction and competency development. The framework does not treat gamification as an independent instructional method; rather, game elements are embedded within inquiry experiences to sustain engagement and encourage learners to participate actively in questioning, investigation, problem solving, and reflection.

The proposed approach can be understood as a progression from curiosity to inquiry, inquiry to knowledge construction, and knowledge construction to competency development. Learning may begin with an engaging phenomenon, problem, or situation that stimulates curiosity. This is followed by inquiry-triggering questions that encourage learners to investigate, gather evidence, and develop explanations. Game elements such as challenges, missions, progressive levels, feedback, choice, and collaboration can then be strategically incorporated to support participation during the inquiry process. The learning experience should ultimately move towards application and reflection so that learners can connect their newly constructed understanding with unfamiliar situations. Thus, the role of gamification is not simply to make inquiry enjoyable. Its purpose is to create motivational and experiential conditions that encourage learners to remain involved in intellectually meaningful activities. The central principle of IBGL is therefore alignment: game elements should serve the inquiry question, learning objective, and competency being developed.

IBGL and Competency Development

The integration of inquiry and gamification provides opportunities for learners to practise competencies through meaningful learning experiences. Inquiry encourages learners to analyse evidence, question assumptions, develop explanations, and solve problems, thereby supporting critical thinking. Open-ended challenges can create opportunities for creativity, while collaborative investigations and missions can strengthen communication and collaboration. Similarly, progressive challenges can encourage learners to apply knowledge, make decisions, test alternatives, and revise their approaches. Feedback can help learners recognize their progress and identify areas for improvement. Reflection further enables learners to examine not only what they have learned but also how they approached the learning process.

The relationship can therefore be expressed as:



The proposed integration has several implications for contemporary teaching and learning. First, it reinforces the shift from teacher-directed knowledge transmission towards learner-centred knowledge construction.

DISCUSSION

The conceptual argument developed in this paper suggests that the changing purpose of education requires corresponding changes in classroom pedagogy. If education is expected to prepare learners for uncertain and evolving futures, learning environments must provide opportunities to use knowledge rather than merely reproduce it.

Inquiry-based learning addresses this need by engaging learners as active participants in the process of asking questions, conducting investigations, and constructing their own understanding. However, inquiry can involve uncertainty, difficulty, and sustained effort. Gamification offers a complementary mechanism through which challenges, feedback, progression, choice, and collaboration can support continued participation.

The significance of IBGL therefore lies in the relationship between inquiry and gamification rather than in either approach independently. Inquiry provides the intellectual purpose of learning, while gamification can provide motivational and experiential support. When appropriately aligned, game elements can encourage learners to engage more deeply with questions, problems, evidence, and explanations.

However, gamification should not be equated with entertainment or the simple addition of points and rewards. Its educational value depends on the quality of its pedagogical design. Excessive competition or reward-focused activities may distract learners from conceptual goals. Similarly, inquiry requires appropriate scaffolding according to learners' prior knowledge and developmental readiness. Therefore, teachers play a critical role in determining the appropriate balance between learner autonomy, guidance, challenge, and support.

IBGL also has implications for assessment. If education aims to develop competencies, assessment should capture learners' ability to apply knowledge, solve problems, communicate ideas, collaborate, and reflect. Thus, performance tasks, observation, rubrics, collaborative products, and reflective activities may complement conventional assessment approaches.

Implications for Future-Ready Learning

The proposed framework has implications for classroom practice, teacher education, curriculum design, and assessment. At the classroom level, it encourages teachers to move from primarily delivering content towards designing experiences in which learners investigate meaningful questions and apply knowledge to challenges.

For teacher education, it highlights the need to prepare teachers not merely to use educational technologies but to design pedagogically meaningful inquiry and gamified experiences. For curriculum development, it suggests stronger alignment among content, competencies, pedagogy, and assessment.

Most importantly, IBGL supports the broader movement towards future-ready education by creating opportunities for learners to practise critical thinking, creativity, communication, collaboration, problem solving, agency, and reflection within meaningful learning contexts.

CONCLUSION

The changing educational system calls for a shift from viewing learning primarily as the acquisition of knowledge to understanding it as the development of learners' ability to apply knowledge meaningfully in diverse situations. Future-ready learners need to question, investigate, create, communicate, collaborate, solve problems, and adapt to situations that cannot always be predicted.

Inquiry-based learning provides a strong foundation for this transition by engaging learners in questioning, investigation, evidence-based reasoning, knowledge construction, and reflection. Gamification can complement this process by providing purposeful challenges, feedback, progression, choice, and opportunities for sustained engagement.

The proposed Inquiry-Based Gamified Learning (IBGL) approach therefore positions inquiry as the intellectual foundation and gamification as a motivational and experiential support structure. Its purpose is not to make learning merely more entertaining, but to create conditions in which learners actively engage with meaningful questions and challenges.

REFERENCES

1. Bianchini, J. A., & Colburn, A. (2000). Teaching the nature of science through inquiry to prospective elementary teachers: A tale of two researchers. Journal of Research in Science Teaching, 37, 177–209.
2. Blanchard, M. R., Southall, G. A., & Osborne, J. W. (2010). The development of science self-efficacy and interests. Journal of Science Education and Technology, 19(4), 331–343. https://doi.org/10.1007/s10956-010-9203-1
3. Budhia, N., & Behera, S. (2023). Challenges and opportunities of digital education in India. Asian Journal of Education and Social Studies, 45(3), 1-7.
4. Csikszentmihalyi, M. (1990). Flow: The psychology of optimal experience. Harper & Row.
5. Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. Psychological Inquiry, 11(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01
6. Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining "gamification." Proceedings of the 15th International Academic MindTrek Conference, 9–15. https://doi.org/10.1145/2181037.2181040.
7. Dewey, J. (1938). Experience and education. Macmillan.
8. Hakulinen, L., Auvinen, T., & Korhonen, A. (2013, March). Empirical study on the effect of achievement badges in TRAKLA2 online learning environment. In 2013 Learning and teaching in computing and engineering (pp. 47-54). IEEE.
9. Köksal, M. S. (2008). Improving cooperative learning in science and technology lessons: An action research study. International Journal of Environmental & Science Education, 3(2), 65–74.
10. Kumar, B., & Khurana, P. (2012). Gamification in education: Learn computer programming with fun. International Journal of Computers and Distributed Systems, 2(1), 46-53.
11. Lawson, A. E. (2010). Basic inferences of scientific reasoning, working memory, and knowledge representation. Journal of Research in Science Teaching, 47(2), 129–146. https://doi.org/10.1002/tea.20316
12. Lawson, A. E. (2010). Teaching inquiry science in middle and secondary schools. California: Sage Publications.
13. Llewellyn, D. (2002). Inquiry within: implementing inquiry-based science standards. USA: Corwin Press, Inc. A Sage Publications Company.
14. National Education Policy 2020. (2020). New Education Policy 2020. Ministry of Education, Government of India.
15. Parim, G. (2009). The effects of inquiry on the concept learning, achievement and development of scientific process skills of 8th grade students as related to photosynthesis and respiration. Unpublished Doctoral Dissertation. Marmara University.
16. Pedaste, M., Mäeots, M., Siiman, L. A., de Jong, T., van Riesen, S. A. N., Kamp, E. T., Manoli, C. C., Zacharia, Z. C., & Tsourlidaki, E. (2015). Phases of inquiry-based learning: Definitions and the inquiry cycle. Educational Research Review, 14, 47–61. https://doi.org/10.1016/j.edurev.2015.02.003
17. Piaget, J. (1954). The construction of reality in the child. Basic Books.
18. Piaget, J. (1977). The development of intelligence in children. Basic Books.
19. Paul, K., Kuhlthau, C. C., Branch, J. L., Solowan, D. G., Case, R., Abilock, D., Eisenberg, M. B., Koechlin, C., Zwaan, S., Hughes, S., Low, A., Litch, M., Lowry, C., Irvine, L., Stimson, M., Schlarb, I., Wilson, J., Warriner, E., Parsons, L., … Hamilton, D. (2003). Library skills. School Libraries in Canada, 22(4), 2–44.
20. Taguma, M., & Barrera, M. (2019). OECD future of education and skills 2030: Curriculum analysis.OECD.https://www.oecd.org/education/2030-project/teaching-and learning/learning/learning-compass-2030/

21. Taguma, M., Makowiecki, K., & Gabriel, F. (2023). OECD learning compass 2030: Implications for mathematics curricula. In Mathematics curriculum reforms around the world: The 24th ICMI study (pp. 479-509). Cham: Springer International Publishing.
22. UNESCO, P. (2021). Reimagining our futures together: A new social contract for education (pp. 1-186). Paris: UNESCO.
23. Voogt, J., Erstad, O., Dede, C., & Mishra, P. (2013). Challenges to learning and schooling in the digital networked world of the 21st century. Journal of Computer Assisted Learning, 29(5), 403-413.
24. Zainuddin, Z., Chu, S. K. W., & Perera, C. J. (2024). Gamification in education. In Gamification in a flipped classroom: Pedagogical methods and best practices (pp. 67-113). Singapore: Springer Nature Singapore.
25. Zhang, F., Brynildsrud, H., Papavlasopoulou, S., Sharma, K., & Giannakos, M. (2025). Where inquiry-based science learning meets gamification: a design case of Experiverse. Behaviour & Information Technology, 44(5), 1099-1121.