Exploring the Integration Dynamics of Game-Based Learning in Education: Benefits, Challenges and Opportunities in GenAI Era

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Abstract: A Modern-day classroom, particularly in the 21st century, is not only technologically innovative but must be an adaptive and lecturertainer-driven environment that captivates student-centric Teaching and Learning (T&L). While the acceleration of technological innovation continues to transform T&L methodologies, the integration of Artificial Intelligence (AI) and the rise in Generative AI (GenAI) are gradually eroding the traditional lecturing approaches. This study explores the integration dynamics of Game-based Learning (GBL) in education to give insights on the benefits, challenges and opportunities of GBL in modern-day T&L, in Higher Education. A qualitative study using a semi-structured literature review approach to identify current research on the integration of Game-Based Learning (GBL), in higher education, has found that the integration of games in education contributes to students' academic success. However, little to no consensus has been reached on how effective in the application of GBL frameworks across disciples. This underscores the need in-depth understanding of the benefits, challenges and opportunities which also calls for interrogation on the long-term impacts of gamification in education. Findings reveal existing implementation complexities of GBL experiences in distinct contextual disciplines. The study concludes that the consistent transformations in T&L approaches driven by the integration of GBL's practices should still be driven by Higher Education Pedagogical goals. This approach will enhance students' Higher-Order Thinking (HOT) rather than being a mere classroom engagement satisfaction exercise.

Keywords: Artificial Intelligence, Game-based Learning, Gamification, HEIs, Higher-Order Thinking.

1. Introduction

Modern day classrooms are becoming increasingly driven by technology. This shift has made it lecturertainer-driven where lecturers need to adapt the Teaching and Learning (T&L) space to better support their students' workplace readiness (Mkuti & Munyeka, 2025; Mkuti & Mbonambi, 2026).

The latest studies indicate that technologies such as robotics and Artificial Intelligence (AI) are transforming the job market and creating a demand for new digitalised skills. The vision of the 5IR is for technology to serve humanity through a symbiotic relationship that enhances human capabilities (Abdulaziz et al. 2025). Recent research suggests that an increasing adoption of GenAI is reshaping higher education by influencing teaching practices, student learning experiences, and institutional approaches backed by technological advancements (Batista, Mesquita & Carnaz, 2024). To an extent, technological advancements in education created universal opportunities for more personalised learning, enhanced student engagement, and the development of new digital competencies required for future workplaces.

The aim of this paper is to contextualise the application of GBL and gamification in education. It explores how the integration dynamics of Game-based Learning (GBL) in education enhance in-depth insights on the benefits, challenges and opportunities of GBL in modern-day T&L, in Higher Education environments. It begins with a brief literature review followed by the study's methodology. Thereafter, it discusses the pedagogical transformation in the era of GenAI to better contextualise how GBL and gamification emerged as student engagement strategies advancing student success. Thereafter, an overview of the GBL will provide insights on the benefits and challenges of its implementation, in education, as well as the opportunities its adoption create Future-Ready Graduates.

The data collected aided the study to respond to these research questions (RQs):

> RQ1: What extent has the Integration of Game-based Learning in Education contribute to benefits in students' success?
>
> RQ2: What are the challenges and opportunities of GBL, in education?

The review incorporated both international and African literature to facilitate comparison of global trends with the contextual opportunities and challenges associated with GBL implementation in African higher education. The objectives thereof are to:

1. Explore the integration of Game-based Learning in Education and its contribution to students' success.
2. To determine the challenges and opportunities in the adoption of GBL, in education.

Finally, a conclusion will be drawn consolidating the findings and pathway forward.

2. Literature Review

The literature review on the pedagogical transformation in GenAI era reveals both challenges and opportunities. It also enables a contextual engagement with a student-centred approach to education through adoption of pedagogical strategies that enhance students' academic success in a highly technologically driven era. Barrot (2022) highlights that, the Fifth Industrial Revolution (5IR) builds on the digital advances of the Fourth Industrial Revolution (4IR) by placing greater emphasis on human-centred innovation and sustainability. This transitional development is vital as it includes human-robot collaboration, renewable energy, sustainable agriculture, and advanced technologies that support a more sustainable future. Moreover, even with the ongoing technological advances in Higher Education Institutions (HEIs), many graduates still lack the skills required by global industries. These developments place new demands on higher education institutions to reconsider how students are prepared for increasingly technology-mediated workplaces. Within this changing pedagogical context, GBL represents one approach through which higher education can support active, collaboration and cognitively demanding learning experiences. In higher education the use of GBL has been adopted in various fields of studies where students have reportedly improved in their adaptability, motivation and critical thinking (Mkuti & Mbonambi, 2026).

South African institutions have experienced several transformational challenges since post-democratic era. The major challenge has been associated with the implementation of equitable access and transformative educational practices outcomes when the "democratic government adopted the White Paper" (Mkuti & Aucamp, 2024:194). Scholars agree that the adoption of GBL as an active learning strategic approach enhances the chalkboard-talking predominant in traditional T&L methods. However, the success of this transformative educational approach requires reinforcement (Akhmetova et al. 2025).

There are several benefits that can be drawn from GBL popularity in HEIs. Although, it is worth noting that gamification differs from GBL. On the one hand, GBL uses games as an instructional strategy to support the acquisition of knowledge and skills. On the other hand, gamification applies game elements to traditional learning activities to increase motivation and active engagement (Alonso-Sanchez, Alonso & Santana-Monagas 2025; Mkuti & Munyeka, 2025). The most appealing pedagogical strategy aspects of gamified learning is its ability to enable students to become actively involved in regulating their own learning experiences since the activities are directly linked to real-time learning in non-game context of learning.

Ferreira and Titus-Dawson (2026) contend that despite being a favourable pedagogical strategy which enhances learners' academic performance, learning motivation and subject comprehension, the implementation of GBL in South African institutions has not been fully implemented. The existence of under-resourced learning institutions limits effective implementation of GBL strategies. Furthermore, the lack of required training and knowledge of adequate digital tools derails the wider adoption of structured integration of game-based educational content.

3. Methodology: a Semi-Structured Literature Review Approach

This study adopted a qualitative research design using semi-structured literature review to synthesise existing scholarship on the integration of Game-Based Learning (GBL) in higher education. A semi-structured literature review was selected because it provides a structured yet flexible approach to examining existing research, allowing the researchers to identify emerging themes, compare findings across studies and develop a conceptual understanding of a developing field (Snyder, 2019).

Multiple electronic databases, including EBSCOhost, ERIC, Google Scholar, SpringerLink and ScienceDirect, were searched to collect open-source data and to ensure broad coverage of peer-reviewed educational research. Search keywords items included combinations of Game-Based Learning (GBL), Higher Education, student engagement, motivation, active learning, Higher-Order Thinking (HOTS), Blooms Taxonomy, Artificial Intelligence (AI), Generative Artificial Intelligence (GenAI), Fifth Industrial Revolution (5IR) and future-ready graduates.

The review included peer-reviewed journal articles, scholarly book chapters and conference proceedings published between 2020 - 2025, with seminal theoretical literature incorporated where necessary to provide conceptual foundation of key terminologies. Furthermore, only studies published in English focusing on GBL

within education were considered. On the other hand, duplicate publications, opinion articles, blogs, newspaper reports and studies unrelated to education were excluded from the review.

The identified literature was screened in stages to ensure that the literature reviewed are not only relevant to the study but also respond to the research questions. Covidence (2024) maintains that screening of literature is one of the most resource intense research tasks that ensure data collection that is relevant, consistent, non-replicable, and of good quality. This study followed two steps beginning with the title and abstract screening to identify and remove irrelevant studies through a comprehensive inclusion and exclusion criteria. Secondly an eligibility criterion followed with full-text examination of potentially relevant sources. In this step, sources were retained when they directly addressed Game-Based Learning, higher education, pedagogical integration, student learning or the broader themes identified in the research questions. Duplicate and non-relevant sources were excluded. Following this screening process, the final corpus consisted of 30 sources that were considered sufficiently relevant to address the research questions and were subsequently subjected to thematic analysis. The selected literature was analysed using thematic analysis following Braun and Clarke (2022).

The researchers familiarised themselves with the selected literature and identified recurring concepts and patterns relevant to the research questions. Findings across studies were then compared and grouped according to similarities and differences. Furthermore, related concepts were subsequently organised into broader themes, which were reviewed and refined to ensure alignment with the research questions. The final themes included pedagogical transformations, motivation and engagement, benefits and challenges of GBL, HOTS and Bloom's Taxonomy, and opportunities for preparing future-ready graduates.

4. Discussion

4.1 Pedagogical Transformation in the Era of GenAI

The rapid development of educational technologies has increased the need for innovative approaches to Teaching and Learning (T&L) that respond to the changing needs of the students. The emergence of Generative Artificial Intelligence (GenAI) has further accelerated this pedagogical transformation. Mkuti (2025) notes that the growing use of GenAI models such as ChatGPT has influenced the customisation of T&L content. At the same time, the increasing reliance on AI raises concerns about student's engagement with learning and the role of educators in supporting meaningful learning. Bladergroen et al. (2024) therefore emphasise student-centred pedagogies and self-directed learning (SDL), which can provide learners with opportunities for purposeful and developmental engagement. Taken together, these studies indicate that the influence of GenAI extends beyond the introduction of new technological tools. Furthermore, it is also prompting a reconsideration of how teaching is structured and how students are supported to take greater responsibility for their learning. This suggests that pedagogical transformation in the GenAI era requires approaches that combine technological innovation with active and self-directed learning rather than simply increasing student's access to AI tools.

It is evident that GBL has become apparent as one student-centred approach within this changing pedagogical environment. Akhmetova et al. (2025) identify GBL as a pedagogical approach that can support active participation and cognition, while also contributing to student motivation. Batista et al. (2024) similarly emphasises the need for educators to reconsider teaching approaches as GenAI reshapes higher education. When considered together, these findings suggest that the relevance of GBL in the GenAI era lies not simply in its ability to make learning more engaging, but in its potential to provide active learning experiences that develop broader cognitive and digital competencies. Such an approach is particularly relevant to preparing students for work environments in which adaptability, problem-solving and ethical digital competence are increasingly important. However, the literature also indicates that the potential of technology-enhanced pedagogies cannot be separated from educator readiness. Therefore, continuous professional development is necessary to enable educators to make purposeful pedagogical use of emerging technologies rather than simply introducing new tools into existing teaching practices.

Maluka and Mulaudzi (2025), for instance, have identified several barriers to professional development such as, limited pedagogical knowledge, lack of managing support, insufficient self-directed learning, inadequate professional ethics, and an uncertainty about their professional identity. These challenges highlight that providing educators with access to new technologies does not necessarily translate into effective pedagogical integration. Chikwaka et al. (2024) similarly emphasise that technology integration requires educators to adapt gradually rather than just adding new technologies to existing practices. Overall, these findings suggest that pedagogical transformation is a developmental process rather than once-off technological intervention. The

effectiveness of technology-enhanced approaches therefore depends not only on the availability of digital tools, but also on educator's capacity to understand, adapt and integrate these tools purposefully within their teaching practice. Therefore, continuous professional development and institutional support is placed at the centre of sustainable pedagogical transformation.

5. Overview of GBL and Gamification in Education: Benefits and Challenges of GBL

GBL and gamification have developed as approaches for supporting more engaging and student-centred learning experiences. Akhmetova et al. (2025) indicate that successful GBL depends on interacting factors including student engagement, motivation, instructional design, feedback, teacher support infrastructure and strategic implementation. Similarly, Fagan and Bladergroen (2024) highlight the interaction between technology, pedagogy, cognitive engagement, collaboration and the wider educational ecosystem. The literature therefore suggests that GBL is not simply the introduction of games to teaching, but an integrated pedagogical approach requiring alignment between technology, pedagogy and the learning environment.

5.1 Benefits

Zhao et al. (2022) found that technology-orientated pedagogies such as GBL can support independent learning, active engagement and problem-solving skills. Chikwaka et al. (2024) further emphasise the importance of technology competencies within contemporary education. These findings suggest that the benefit of GBL extends beyond making learning more engaging. When appropriately designed, it can provide opportunities for students to actively apply knowledge, solve problems and develop relevant technological competencies.

Self-determination Theory (SDT) provides a useful theoretical lens for understanding these benefits through the needs for autonomy, competence and relatedness (Deci & Ryan, 2000). GBL may support autonomy by allowing students to take greater ownership of learning, while appropriately challenging activities can support competence by providing opportunities to experience successful problem-solving. This aligns with Bandura's (1977) concept of self-efficacy, where student's perceived capability influences their willingness to engage with more challenging tasks.

Buitrago-Flórez et al. (2021) argue that effective learning occurs when students actively participate in constructing knowledge rather than passively receiving information. GBL supports this active-learning process by providing opportunities for students to explore, collaborate, solve problems and reflect on their performance. Evidence from South Africa and Botswana also reports increased enjoyment, participation and self-directed learning among students engaging in GBL activities (Bunt & Bunt, 2024; Kgosietsile, 2023). Taken together, these findings indicate that the benefits of GBL extend beyond engagement to include active construction of knowledge, reflection and self-directed learning. However, this raises the question of what prevents its widespread adoption.

5.2 Challenges

The integration of GBL within the GenAI era also raises concerns regarding responsible AI use and academic integrity. Batista et al. (2024) emphasises the need for AI literacy and institutional guidance to ensure that GenAI supports rather than replaces critical thinking. Chaka et al. (2024) similarly identify academic integrity, responsible AI use and ethical considerations as important components of South African higher education policies. Mkuti (2025) therefore highlights the need for AI literacy among both educators and students. The literature suggests that digital innovation requires corresponding development in ethical and critical digital literacy indicating that access to technology alone is insufficient.

Lecturer readiness emerged as another important implementation challenge. Akhmetova et al. (2025) identify the need for lecturer training and pedagogical knowledge, while Wichaidit and Wichaidit (2024) emphasise instructional design and educator competence. African studies similarly highlight the importance of professional development and lecturer facilitation in technology-enhanced learning (Fader & Bladergroen, 2024; Bunt & Bunt, 2024). These findings indicate that successful GBL integration depends not only on the availability of technology but also on lecturers' ability to design, facilitate and evaluate meaningful learning experiences.

Infrastructure and unequal access to digital resources present additional challenges, particularly within African contexts. Smith (2023) identifies constraints including internet connectivity, access to devices and unreliable infrastructure, while Fader and Bladergroen (2024) highlight unequal digital access, varying levels of digital literacy and limited technical support in South African education. de Beer et al. (2024) similarly note the

continued prevalence of transmission-mode teaching at the expense of problem-based and cooperative learning. Overall, these findings indicate that the implementation of GBL is shaped by institutional and contextual conditions, meaning that approaches developed in well-resourced environments cannot necessarily be transferred directly to settings where digital access and support remain unequal.

6. GBL and Bloom's Taxonomy (HOTS)

Drawing from multiple studies, GBL has also been widely recognised for its ability to develop higher-order thinking skills (HOTS) by allowing students to actively engage in student-centred learning experiences, (Khoo et al., 2025; Zhao et al., 2022; Akhmetova et al., 2025; Wichaidit & Wichaidit, 2024; Syynimaa et al, 2024; Bladergroen et al., 2024). Rather than simply recalling information, GBL can encourage students to analyse problems, evaluate possible solutions, apply knowledge in meaningful contexts and reflect on their decisions. Overall, these studies suggest that the cognitive value of GBL depends on how learning activities are designed, rather than on the use of games alone.

Anderson and Krathwohl's revised Blooms Taxonomy distinguishes between knowledge dimensions and cognitive process dimensions. Procedural knowledge refers to knowledge of how to perform a task, including methods, techniques and procedures, while metacognitive knowledge refers to awareness and knowledge of one's own cognition (Wilson, 2001). These forms of knowledge can support HOTS when students engage in cognitive processes such as analysing, evaluating and creating.

Kgosietsile (2023) further demonstrates how GBL activities such as solving puzzles, debating real-life ideas, conducting research, making decisions and reflecting on learning can create opportunities for HOTS. Therefore, when GBL is intentionally designed and aligned with the cognitive processes of Bloom's Revised Taxonomy, it can move learning beyond engagement towards active knowledge construction, problem-solving and higher-order thinking.

6.1 Future Ready Graduates

The literature indicates that GBL extends further than engagement and motivation to include collaboration, problem-solving and higher-order thinking. In the context of the 5IR, these competencies are relevant to graduates who are expected to adapt to changing technologies and workplace demands (Barrot 2022; Batista et al., 2024; Bladergroen et. al., 2024., Khoo et. al., 2025). The findings therefore suggest that GBL may contribute to future-readiness when it is intentionally integrated with curriculum objectives and opportunities for students to apply knowledge in authentic contexts.

6.2 Curriculum Transformation

Curriculum transformation in GenAI era is increasingly necessary. The idea of a Curriculum 5.0 provides a possible framework for aligning higher education with changing demands of the 5IR (Barrot 2022). However, any successful transformation must be adopted at all levels of education where the focus of curriculum re-design should lie on how educators promote relevant teaching, learning and assessment implications by channelling cognitive development activities not only in higher education but also in elementary schools (de Beer, Prinsloo, Botha & Govender 2024). In South Africa, for instance, the inclusion of subjects such as Coding and Robotics in Curriculum and Assessment Policy Statement (CAPS) provided an example of curriculum responding to changing technology demands.

6.3 Building Institutional Capacity

Both international and African literature identifies institutional capacity as an important condition for sustaining technology-enhanced pedagogies. HEIs can support GBL integration through lecturer professional development, appropriate infrastructure, technical support and institutional guidance for ethical AI use (Batista et al., 2024; Bladergroen, 2024; de Beer et al., 2024; Khoo et al. 2025; Mkuti, 2025). This suggests that future-ready education requires institutional support alongside pedagogical innovation. Therefore, introducing digital tools without developing the capacity to use them purposefully is unlikely to produce sustainable change.

6.4 Preparing Future-Ready Graduates

The findings indicate that GBL extends beyond student engagement and motivation by providing opportunities for active learning, collaboration, problem-solving and development of higher-order thinking skills (HOTs). These

capabilities are relevant to future-ready graduates because they require students to apply knowledge, respond to problems and work collaboratively rather than only recall information. When GBL activities are deliberately aligned with learning outcomes, assessment and higher-order cognitive processes, they can provide opportunities for students to practice these capabilities within authentic or simulated learning contexts.

The corpus literature places an emphasis on the valuable role of GBL in offerings higher education institutions the opportunity to enhance preparedness of its graduates' skills to become future-ready (Bladergoen et al., 2024; Kgosietsile, 2023). However, to prepare future-ready graduates, curriculum transformations driven by GBL pedagogy must prioritise enhanced higher-order thinking skills amongst graduates through continuous digital adaptability to solve complex problems (Barrot, 2022; Khoo, et. al., 2025).

7. Conclusion

This semi-structured review explored the integration dynamics of GBL in higher education by examining its benefits, challenges and opportunities it presents in preparing future-ready graduates. The review was situated within the changing educational field of the GenAI era and the human-centred technological demands associated with the Fifth Industrial Revolution (5IR). When intentionally designed and aligned with learning outcomes and Blooms' Revised Taxonomy, GBL can create opportunities for students to analyse, evaluate, apply and create rather than merely recall information. These capabilities are relevant to the development of cognitive, digital and collaborative competencies associated with future-ready graduates (Sawahel, 2021; Shibambu, 2024; Barrot, 2022; Khoo, et. al., 2025; Bladergoen et al., 2024).

However, the findings also demonstrate that educational value of GBL does not result from the use of games or digital technologies alone. Successful integration depends on the alignment between pedagogical design, curriculum objectives, educator preparedness and the institutional environment. The literature identified lecturer competence, professional development, curriculum transformation, institutional support, digital literacy, ethical AI use, infrastructure and equitable access to technology as important considerations influencing implementation (Wichaidit & Wichaidit, 2024; Akhmetova et al. 2025; Batista, et al., 2024). Resource constraints and unequal access to digital technologies remain concerns within some African educational contexts (Ferreira & Titus-Dawson 2026). These findings therefore reinforce the importance of viewing GBL as a pedagogical approach that requires purposeful integration and contextual support, rather than as a technological intervention in isolation.

The review further identifies opportunities for higher education institutions to use GBL as part of broader curriculum and institutional transformation. Curriculum design can create opportunities to integrate active learning, HOTS, digital competencies and authentic problem-solving, while institutional investment in professional development, infrastructure and ethical digital practices can support sustainable implementation. Within the 5IR context, these developments may contribute to graduates who are more adaptable to changing technological and workplace environments. However, the findings do not suggest that GBL alone can produce future-ready graduates, but rather, its contribution depends on how deliberately it is integrated with curriculum, teaching, assessment and institutional support.

Overall, the review suggests that the central value of GBL lies not simply in making learning more engaging, but in how game-based pedagogy can support meaningful cognitive, collaborative and digital learning experiences when appropriately designed and implemented. This shifts the focus from adopting GBL as an innovative technology towards considering how it can be purposefully integrated into teaching and learning to support student success and future-readiness. Further research should therefore investigate context-specific and sustainable approaches to GBL implementation, particularly within African higher education institutions where differences in infrastructure, digital access, institutional capacity and educator preparedness may influence how GBL can be meaningfully adopted.

Ethics and AI Declarations

ChatGPT (OpenAI) was used as a writing support tool during the preparation of this manuscript. ChatGPT assisted with refining the structure of the paper, improving the clarity and readability of selected sections. The authors critically reviewed and revised the sources ensuring an ethically responsible production of this scholarly work. The authors checked all retrieved material against the scholarly databases. All literature searches, source selection, interpretation of findings, critical analysis and final decisions regarding the content of the manuscript

were fully undertaken by the authors. Therefore, the authors accept full responsibility for the accuracy, originality and integrity in the production of this manuscript.

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