ThinkBox: When gamification meets artificial intelligence: rethinking learning experiences

1. Introduction

In the dynamic landscape of education and professional development, the fusion of gamification and artificial intelligence (AI) emerges as a promising combination, capable of transforming how we acquire knowledge, develop skills and engage in learning processes (Liu, 2024).

Gamification, with its roots in behavioural psychology (Isaías, 2018), can be understood as the adoption of game elements in non-game contexts (Deterding, Dixon, Khaled, & Nacke, 2011) – to stimulate intrinsic motivation and engage individuals in activities that might otherwise be considered tedious (Rebelo & Isaias, 2020; Yang & Qian, 2024). This approach transforms the learning process into a playful and meaningful experience, making participants feel more engaged and motivated to achieve goals (Trinh, Chico, & Reed, 2023).

AI, in turn, represents a significant advancement in terms of adaptation and personalization of learning. With its ability to process large volumes of data, identify patterns and offer tailored solutions, AI has the potential to create customized learning pathways for each individual, addressing the specific needs of each "player" and promoting continuous and progressive learning (Abbes, Bennani, & Maalel, 2024). By integrating the Hexad model, for instance, AI can identify the six motivational player profiles – philanthropists, socialisers, free spirits, achievers, disruptors and players – and adjust gamified elements to cater to the specific motivations of each profile. This includes personalizing rewards, challenges, narratives and interactions so that each learner finds meaning and engagement aligned with their intrinsic and extrinsic motivations, maximizing learning effectiveness (Santos, Oliveira, Altmeyer, Hamari, & Isotani, 2022; Tondello, Mora, Marczewski, & Nacke, 2019).

Together, gamification and AI enable learning experiences to be not only motivating but also tailored to the profile and objectives of each participant. Tools such as gamified learning platforms and AI-based educational assistants exemplify how these technologies can work together to create more dynamic and responsive learning environments (Liu, 2024).

In examining this intersection, this ThinkBox will discuss how gamification, with its playful and motivating elements, can be enhanced by AI to create personalized experiences tailored to the needs of each individual, fostering more meaningful and inclusive learning. Furthermore, we will reflect on the ethical challenges and social implications of this combination, highlighting the importance of human-centred design and a commitment to achieving positive outcomes for society.

2. Transformations in educational and corporate contexts

The intersection of gamification and AI is transforming the technology-supported teaching and learning process in educational and corporate settings by creating personalized experiences, adaptive feedback mechanisms and engaging, dynamic learning environments (Abbes *et al.*, 2024; Liu, 2024).

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In educational settings, whether face-to-face, hybrid or online, gamification has stood out for its ability to transform traditional activities into playful and motivating experiences (Pardim, Contreras Pinochet, Viana, & Souza, 2023). Elements such as points, badges, leaderboards, levels, rankings and narratives help students connect with learning, making it more engaging and fostering a willingness to overcome challenges (Singh, 2024).

When combined with AI, this active methodology becomes even more powerful, as it allows for task difficulty adjustment, personalized rewards and experiences tailored to each student's needs. Tools such as ALEKS and BYJU'S demonstrate that the combination of AI and gamification can identify knowledge gaps and provide targeted support, resulting in greater knowledge retention, improved academic performance and increased inclusion (Suresh Babu & Dhakshina Moorthy, 2024).

Thus, students facing difficulties can receive additional support, while more advanced learners are challenged with demanding tasks. This adaptability is especially crucial in contexts where teachers must manage large groups of students in the classroom, ensuring that each learner's needs are met in a personalized manner (Isaías, 2018).

The issue at hand is not the replacement of teachers or the advocacy of overcrowded classrooms as a solution to educational challenges, as some perspectives might suggest, but rather providing educators with strategic support to refine their work. AI should act as a partner, enabling teachers to focus on the human aspects of education – such as fostering meaningful discussions, mediating conflicts, motivating students and encouraging critical thinking – while AI takes care of operational tasks and data analysis (Zhai, 2024).

The corporate context is no different. Gamification and AI have been reshaping how companies conduct training and develop employee skills. Gamification transforms tasks into interactive and engaging experiences, reducing resistance to training programs and making learning more dynamic. AI enhances these training efforts by personalizing content based on behavioural data, tailoring materials to the specific needs of each employee, as exemplified by Axonify (Rana & Chicone, 2025).

Despite its transformative potential, the integration of AI and gamification in corporate settings also raises significant concerns, inappropriate actions and unforeseen effects, such as the possibility of excessive employee monitoring, the manipulation of intrinsic motivation through artificial rewards and the risk of dependence on automated systems that may fail to consider human nuances, such as cultural or emotional contexts, when personalizing training (Singh, 2024).

Regardless of the context, whether educational or corporate, for those involved in the development of gamified activities, AI can serve as a strategic tool for planning, implementing and monitoring interventions that address the specific needs of participants. This includes real-time data analysis to adjust content, providing detailed and immediate feedback on progress and performance, gradual progression, collaborative activities and identifying behavioural patterns that can guide continuous improvements in proposed activities (Rana & Chicone, 2025). Moreover, AI enables the creation of more inclusive experiences, accommodating different learning profiles and ensuring that everyone has equal opportunities for engagement and development (Suresh Babu & Dhakshina Moorthy, 2024).

3. The future of learning with gamification and AI

The future of learning, driven by the combination of gamification and AI, is shaped by trends and innovations that promise to transform not only the educational environment but also the labour market (Abbes *et al.*, 2024).

Tools such as chatbots, recommendation systems and programming assistants exemplify how AI can enrich the learning process, especially in a gamified context, where adaptive interaction is essential to maintain the dynamics of learning (Isaías, 2018; Pinochet, Moreira, Fávero, Santos, & Pardim, 2023).

A promising innovation in this context is gamified intelligent tutoring systems. Leveraging AI, they function as personalized "tutors," guiding students through content tailored to their skills, learning styles and specific needs, providing a unique and more effective learning experience. These systems go beyond traditional platforms by using real-time data to create dynamic learning pathways. For instance, if a student struggles with a particular topic, the intelligent tutoring system can adjust proposed challenges, reduce complexity or suggest specific revisions to reinforce the content. Meanwhile, gamified elements keep the student engaged and promote a sense of progress (Ramadhan, Warnars, & Razak, 2024).

However, an important question must be asked: To what extent can gamification and AI, in redesigning learning experiences, balance personalization and motivation without turning learning into a purely instrumental experience focused solely on measurable outcomes?

This question highlights the importance of striking a balance between leveraging advanced technologies and preserving the human and creative aspects of the learning process. While the personalization enabled by AI and gamification can offer tailored and stimulating pathways, it is essential to ensure that these tools also foster critical thinking, complex problem-solving and collaboration – essential skills for the 21st century.

Moreover, learning should go beyond the achievement of immediate goals, promoting curiosity, reflection and the practical application of knowledge in real-world contexts. The challenge lies in integrating these technologies in a way that not only improves academic and professional outcomes but also strengthens autonomy, intrinsic motivation and the holistic development of individuals. Thus, the future of learning will depend on how we balance technological advancements with the need to develop ethical, creative citizens equipped to tackle the challenges of a constantly evolving world.

The evolution of AI also raises significant ethical challenges that cannot be overlooked. It is crucial that gamified intelligent systems are developed with transparency, respect for privacy and accessibility. Ethical design must ensure that these technologies promote inclusion, avoiding the reinforcement of inequalities or the creation of harmful dependencies (Böckle & Kouris, 2023). Furthermore, it is necessary for educators and professionals to maintain control over how these systems are utilized, ensuring that technology complements – rather than replaces – human interactions. By balancing technological innovation with human values, these tools have the potential to redefine what it means to learn in the 21st century.

However, the future of learning with gamification and AI must address a central ethical challenge: ensuring that access to these technologies is universal and inclusive. Digital exclusion, driven by social, demographic and educational inequalities, remains a significant barrier that could limit the benefits of these innovations (Isaías, 2018). It is crucial that technological solutions are designed to bridge these gaps, promoting equitable access and providing adequate support for varying levels of technological literacy.

4. Final considerations

The convergence of gamification and AI presents a promising horizon for transforming teaching and learning processes in both educational and corporate domains. This combination has demonstrated significant potential to create personalized, dynamic and engaging experiences while fostering engagement and the development of essential 21st-century skills. Thus, throughout this ThinkBox, we have explored how gamification, with its playful and motivating elements, and AI, with its ability to analyse and adapt content in real time, provide solutions to the contemporary demands of education and professional development.

Tools and platforms based on this integration offer new possibilities to tailor content to the needs and profiles of learners, providing more effective and inclusive learning pathways.

However, the success of this approach relies on human-centred design, which not only incorporates motivating and adaptive elements but also upholds fundamental ethical values. Issues such as privacy, transparency, digital inclusion, digital literacy and the preservation of intrinsic motivation must be rigorously addressed to ensure that educational technologies

complement – rather than replace – the essential role of teachers and human interaction in the teaching and learning process (Böckle & Kouris, 2023).

Furthermore, it is imperative that the dissemination of these technologies take socioeconomic disparities into account, promoting equitable access and reducing digital divides. In other words, ensuring accessibility to these technologies is essential to prevent the deepening of social and educational inequalities. Only through an ethical, inclusive and strategic approach will it be possible to realize the full transformative potential of the integration of gamification and AI in learning, benefiting not only a technological elite but also vulnerable populations.

In terms of research, future studies could explore ways to deepen the understanding of how different user profiles respond to gamified elements personalized by AI, considering factors such as intrinsic motivation, engagement and performance. Empirical investigations could also assess the impact of gamified intelligent tutoring systems in diverse contexts, including environments with limited connectivity, populations with varying levels of digital literacy and multicultural settings.

Moreover, it is necessary to explore how advanced algorithms can be developed to identify and mitigate biases, ensuring that educational solutions are fair and inclusive. Interdisciplinary research involving administration, education, psychology and data science could provide valuable insights into aligning technological advancements with educational, corporate and social objectives.

Another promising avenue involves the longitudinal analysis of the impact of AI and gamification on long-term learning, including knowledge retention, socio-emotional skill development and workforce readiness. Comparative studies between traditional gamified approaches and those integrated with AI could also help identify the most effective gamification elements for different contexts and audiences.

Additionally, there is room to explore the impact of immersive environments, such as the metaverse, on expanding the applicability and engagement provided by these technologies.

Finally, the exploration of ethical and regulatory challenges associated with these technologies must also be prioritized, including studies on the acceptance of gamified systems and the development of guidelines for their responsible use. By addressing these gaps, research can not only advance the field but also contribute to the development of solutions that truly transform education and learning into an accessible, meaningful and sustainable experience.

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