Advancements in technology-enhanced assessment in tertiary education

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The field of assessment in tertiary education is currently experiencing a significant shift mostly due to the technological advancements. Technology is, in fact, both threatening assessment practices and empowering them when integrated in the assessment process. This special issue discusses the evolution of technology-enhanced assessment in tertiary education focusing on the use of digital resources such as gamification and artificial intelligence to improve learning and evaluation methods. Research findings showcased in this issue delve on the ability of technology-enhanced assessments to promote effective personalised learning experiences while also addressing the ethical dilemmas these innovations bring. The blend of conversations about assessment with AI driven evaluations, immersive simulations and gamified platforms explores the benefits and challenges for teachers and learners alike, not forgetting the importance of sound methodological approaches for both summative and formative assessment. This editorial summarises contributors' perspectives on how these innovations are changing assessment methods and emphasises the importance of integrating them thoughtfully. At the same time, questions are raised about the evolving role of educators in a technology-driven educational landscape.

Keywords: technology-enhanced assessment, AI in education, formative assessment, gamification, simulation-based learning, personalised learning, academic integrity

Introduction

New technologies are acquiring an increasingly important role in education, revolutionising academics' professional practice and students' learning paths by providing the possibility to personalise and support learning experiences and automate educational processes. When it comes to the design and implementation of assessment practices, for example, using technology to deliver real-time feedback provides an opportunity for a more inclusive and effective learning environment (Devedžić & Devedžić, 2019; Kamalov et al., 2023). Rather than merely automating educational processes, digital tools such as generative artificial intelligence (GenAI) have the potential to create new teaching, learning and assessment opportunities that would otherwise be hard to achieve. On the one hand, they challenge traditional teaching methods; on the other they have the potential for helping educators and students to become more effective. Currently, the implementation of various AI in education technologies and technology-enhanced assessment (TEA) approaches can help monitor student progress, support them and assess whether a student has mastered a specific skill or knowledge (Agostini & Picasso, 2024).

This special issue focuses on exploring assessment methodologies and technologies specifically suited for tertiary education. By examining the intersection between emerging technologies and assessment design, this special issue aims to provide AJET readers with insights and inspire thoughtful reflections on the evolution of assessment strategies in the digital era.

Within this scope, the three main themes emerged from the contributors to the special issue are the following:

- technology-enhanced formative assessment and feedback
- gamification and simulation-based learning and platforms for assessment
- AI-powered assessments.

Technology-enhanced formative assessment and feedback

The Joint Information Systems Committee of the United Kingdom (JISC, 2010) report "Effective assessment in a digital age. A guide to technology-enhanced assessment and feedback" highlighted the power of introducing technology into assessment and feedback practices and the possibility to support and improve these approaches and actions through the use of specific digital tools and strategies that "must add value to current practices, for example by making the experience of assessment more authentic or appropriate, by enabling learners to more effectively monitor and correct their own learning, by increasing the validity and efficiency of assessments or by improving the quality and timeliness of feedback" (JISC, 2010, p. 17).

TEA has the potential to reduce staff workload by automating tasks when assessments are valid and reliable and include automated and personalised feedback. However, these benefits can be offset by challenges, such as the time and effort required to set up and manage TEA systems, especially on social media platforms, as well as concerns over assessment validity and feedback quality (Kiersey et al., 2018). TEA practices can lead to multiple types of assessments, new summative assessment strategies, the development of key competencies like collaboration and the use of data analytics to enhance assessment practices (Picasso et al., 2024).

The evolution of TEA thus brings both promising opportunities and complex challenges. In this special issue, Arthars and colleagues' method for evaluating group work through multimodal data and learning analytics demonstrates how technology can reveal previously hidden aspects of collaboration, opening up fresh avenues for analysing student interactions. However, this apparent accessibility raises concerns regarding the equilibrium between quantifiable outcomes and meaningful learning. The investigation of GenAI use in formative e-assessments by Huang and colleagues further enriches this understanding, showing how students gradually shift from traditional learning resources to more balanced use of both AI and conventional materials, particularly when it comes to statistical analysis and calculation questions. The trend of technology adoption aligns with Henderson and colleagues' extensive investigation into online examinations – while technology facilitates broader access to assessment, the obstacles students face often stem from instructional design rather than technical issues. It seems that successful technology integration requires us to think beyond mere digitisation of existing practices. This narrative is further enriched by Bevilacqua and colleagues' investigation of multimedia self-assessment with pre-service teachers, demonstrating how technology can support identity formation and metacognitive processes, while also highlighting the cognitive demands such approaches place on students.

Gamification and simulation-based learning platforms for assessment

As Fisher and Baird affirmed (2006), "in order to educate and train students to become highly competent lifelong members of a learning community, we need to provide an environment that aids retention and development of high-quality thinking and reflection" (p. 5). This section explores two distinct but complementary approaches to creating such environments: gamification and simulation-based learning platforms.

Gamification represents one powerful approach, defined as "the use of game design elements in nongame contexts" (Deterding et al., 2011, p. 9). The adoption of gamification aims to improve learners' motivation and engagement in their educational journey (Goshevski et al., 2017), operating through two main mechanisms: (a) reward-based systems that leverage extrinsic motivation through elements like badges and points and (b) meaningful gamification that focuses on fostering intrinsic motivation for long-term

benefits (Goshevski et al., 2017). Through elements such as scores, rankings and rewards, gamification enables immediate and personalised feedback delivery, encouraging active participation while allowing instructors to track learning progress and gather formative insights (Goksün & Gürsoy, 2019; Hassan et al., 2019; Zainuddin et al., 2020).

Complementing gamification, simulation-based learning platforms offer a different approach to assessment and skill development. These platforms create authentic, risk-free environments where learners can practise and develop professional competencies while receiving structured feedback (Chernikova et al., 2020). Unlike gamification, which adds game elements to existing activities, simulations aim to replicate real-world scenarios and interactions, allowing for deep, experiential learning and the assessment of complex professional skills.

In both approaches, visual panels and dashboards play crucial roles in engaging students and providing feedback about their learning progress, guiding attention to key pedagogical processes (Yoo et al., 2015). However, each serves distinct educational purposes and offers unique opportunities for assessment and learning.

The intersection of simulation-based learning, gamification and assessment platforms reveals evolving approaches to student engagement and learning measurement. Spray and colleagues' examination of simSchool in teacher education demonstrates how simulated environments can bridge the theory-practice gap, providing safe spaces for experiential learning while maintaining rigorous assessment standards. This finding resonates with Slade and colleagues' evaluation of a digital assessment platform, which highlights the complex interplay between technical capabilities and pedagogical impact. Their framework for evaluation emphasises that successful implementation requires attention to both technological and human factors. Together, these studies suggest that while games and platforms offer powerful new assessment possibilities, their effectiveness depends heavily on thoughtful integration with pedagogical goals and attention to student psychological needs.

AI-powered assessments

AI use in assessment and feedback processes can be extremely powerful in terms of the automation of tasks and reduction of the time and effort required by academics. Specifically, it has the potential to improve the consistency, reliability, quality and integrity of assessments by eliminating bias and human error, ensuring fair and accurate evaluations based on objective criteria. AI can also enhance feedback processes, allowing students to receive immediate and personalised responses and quickly identify areas for improvement. Additionally, AI can support large volumes of assessments in online courses or massive open online courses without compromising quality. Moreover, AI can improve the use of learning analytics, which are extremely powerful in order to track student performance, identify common misconceptions and make data-driven decisions (Kamalov et al., 2023). Finally, AI use can open up possibilities for designing and implementing authentic assessment experiences in order to support students in becoming lifelong learners and lifelong assessors (Agostini & Picasso, 2024; Boud, 2000).

This theme contains contributions which are focused on the power of AI in assessment and feedback processes, its impacts, strengths, challenges, limitations and practical applications and implications in relation to the students' learning experiences in tertiary education contexts. The emergence of AI in assessment practices represents a paradigm shift in the way we conceptualise assessment in higher education. The research presented here reveals both the transformative potential and the complexities associated with the incorporation of AI into assessment practices. The investigation conducted by Li and colleagues on ChatGPT's marking capabilities provides crucial insights into the practical implementation of AI in assessment. Although the system exhibits high accuracy and consistency, particularly for higher-quality work, its performance varies significantly based on prompt design. This variation raises important questions about how we should structure and standardise AI-driven assessment practices to ensure reliability and fairness. Barthakur et al. extend the discussion by demonstrating how curriculum analytics can verify the compatibility between professional guidelines and course evaluations. They show how

crucial it is to automate assessment and make sure it matches up with broader educational norms and outcomes. This technical capability is thoughtfully contextualised by Furze and colleagues' study of the Artificial Intelligence Assessment Scale at British University Vietnam. Their innovative approach to introducing a five-level scale for AI integration in assessments represents a structured attempt to move beyond binary discussions about whether or not to allow AI. Their finding that this approach led to fewer academic misconduct cases while improving student engagement with AI tools shows that thoughtful integration can improve academic integrity rather than compromise it. Furthermore, they observed that faculty adapted their teaching practices to incorporate AI tools, resulting in innovative student submissions. This suggests that AI could catalyse a broader pedagogical transformation.

Collectively, these studies suggest that the significance of AI in assessment extends beyond the realm of automation or efficiency enhancements. Instead, they suggest a fundamental reimagining of assessment practices, where AI serves as both a tool and a catalyst for change. They also emphasise the crucial significance of creating frameworks and guidelines for AI integration that uphold pedagogical integrity while leveraging technological capabilities.

Discussion

In relation to technology-enhanced formative assessment and feedback, it is important to affirm that the use of technology tools and enhanced approaches in tertiary education seem to have a complex and important impact on teachers' formative design and on students' learning experience. The adoption of various digital solutions is becoming ever more frequent and the need to understand how to maximise their power is connected to the urgency to equip both educators and students with specific competences and general awareness about related strengths, weaknesses, opportunities and educational implications. The question is: through the implementation of these digital tools, approaches and strategies into teaching, learning, assessment and feedback processes, are we truly enhancing the educational experience, or are we simply mechanising the organisation and the delivery of the formative processes favouring its automation and pushing for their efficiency? Furthermore, are we really taking into account the intrinsic complexity of the tertiary educational environment – such as emotions, creativity, collaboration – and the specificity of the students involved?

When it comes to games and platforms for assessment, the studies included in this special issue highlight the potential of using gamified and simulation contexts to scaffold and enhance assessment and feedback processes. Simulation seems to represent a powerful opportunity to bridge the gap between theory and practice, allowing students to explore and test their abilities in a gamified and technology-enhanced and safe environment that sustains insightful and significant learning experiences that scaffold specific competencies for their future professional profiles.

However, it is important to question ourselves on the real potential of simulations and specific digital assessment platforms to enhance the effectiveness and the quality of the assessment and feedback students' experience. What are the educational impacts of the use of these systems and how can we improve their assessment? Are we truly exploiting their full potential, taking into account possible challenges related to institutions, educators and students' adoption? How can we sustain the integration of these innovative approaches in order to shift the traditional educational system in an effective way?

In essence, these studies reveal a landscape rich in possibilities, and as educators and instructors, we have the responsibility to adopt a critical but also practical perspective in engaging with these systems in our educational daily practice. We have to reflect, through up-to-date research, on how to address challenges in order to maximise the power of assessment systems enhanced by the use of specific platforms, and simulated and gamified environments, in order to scaffold the future of teaching and learning, and assessment in particular, in tertiary education contexts.

To conclude, in relation to AI-powered assessment, this special issue addresses the effectiveness of AI and large language models in marking assignments, demonstrating notable advantages such as scalability,

consistency and a reduction in human bias. It is, however, important to ask ourselves, as educators, how to better manage the benefits and power of AI algorithms to shape our educational landscape. What can we do to inform and modify our own pedagogical practices in the light of scientific evidence results, in order to thoughtfully integrate GenAI into educational processes? What is our role and our responsibility in its use? Furze and colleagues, for example, suggest that, when used responsibly, such tools can actually promote academic integrity and enhance student engagement. Furthermore, as professionals in the field of education, it is necessary that we are able to master their use and at the same time support students' literacy in promoting a sustainable and conscious use of GenAI, thus maximising its educational potential. Conversely, in connection to the assessment and feedback process, are we fostering students' critical thinking or are we crafting an environment where creativity is merely an output of AI-driven submissions?

The studies in this special issue propose an interesting overview of how the educational landscape is rapidly evolving, pushed by the potential of AI, which can represent both a powerful resource and a potential barrier. As educators, we have to deeply navigate the features of AI and technology in order to explore how to really enhance the design, delivery and exploitation of the learning experience, protecting the development of strategic and professional students' skills. Are we ready to confront these complexities, finding structured and thoughtful solutions in an increasingly AI and digitally oriented world?

Conclusions and open questions

The studies included in this special issue present innovative approaches to TEA and offer valuable and critical discussions that demonstrate the potential value of these approaches. Nevertheless, it must be acknowledged that designing and introducing new practices is a time-consuming effort that is often dependent on the enthusiasm of individual educators (Gray & Lazareva, 2022; Tømte et al., 2019). Moreover, educators are required to adhere to the policies and frameworks adopted in their educational institutions, for example, in terms of the ethical issues, privacy, course and exam design, and student rights. Institutional change involves a number of barriers that often come into play (Gray & Lazareva, 2022). Thus, it may be worth reflecting on how successful practices, or their individual elements, can be adopted and implemented on a larger scale and made more sustainable into the future for a larger academic community, instead of merely remaining examples of successful research projects on a relatively small scale. This requires not only making the digital solutions available for to educators but also providing them with clear guidelines and training that would demonstrate the benefits of these solutions. Our hope is that this special issue can be an insightful evidence-based contribution to the field and a step towards closer international collaboration in the higher education sector when it comes to policy-making and development of institutional guidelines in the area of course design and student assessment.

Moreover, the rapid advancement of AI technology specifically sets high requirements and expectations to the teaching staff at all levels to continuously put effort into updating their competence in the area. Large language models such as ChatGPT have shown significant potential to support student learning, for example, when it comes to brainstorming their ideas and serving as the starting point for their critical reflections and discussions with peers (Lazareva et al., 2024). However, it is of crucial importance for teaching staff to acquire the necessary critical and reflective understanding of these technologies first, before they are able to demonstrate to their students how such technologies can be used purposefully to support their learning. This poses a significant challenge, as the development of AI technologies happens at such a fast pace that by the time empirical evidence is published and made available for those who are enthusiastic enough to engage with recent empirical results, the AI technology has already moved several steps forward. Moreover, we should not forget that multiple aspects of teaching and learning, as well as numerous complexities related to the cultural and social circumstances in a particular class or student cohort are challenging or, perhaps, even impossible to capture in a data form in a representative, reliable and quantifiable way. However advanced and developed these systems may become, they will only ever result in an approximation of real-life situations (Selwyn, 2024). This highlights the importance of the critical and informed educators' role. We hope that this special issue can not only contribute to the ongoing international debate on how efficiently support educators' and students' digital literacy

development in a tertiary education context but also inspire educators (and students) themselves in taking an active position in discussions on the role of AI in education, its potential, limitations and possible outcomes (Selwyn, 2024).

Finally, we leave the reader with the following important questions: We are asking students to use or not to use AI: what are the implications connected to the use of AI detectors due to the fact that these systems are not completely reliable? How can we properly use them and under what kind of rules? What are our rules for the use of AI and TEA use? And what are the main ethical concerns?
How do we assess the impacts of the use of AI and TEA in the educational tertiary context?

Author contributions

D. Agostini: Conceptualisation, Methodology, Writing – review and editing; **A. Lazareva**: Conceptualisation, Investigation, Writing – original draft, Writing – review and editing; **F. Picasso**: Methodology, Investigation, Writing – original draft, Writing – review and editing.

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