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Editorial. Board and video games in education: Challenges and opportunities

Editoriale. Giochi da tavolo e videogiochi nell'educazione: Sfide e opportunità

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ABSTRACT Game-Based Learning (GBL) continues to gain traction across educational levels, offering engaging, experiential approaches that foster both disciplinary learning and transversal competences. The articles featured in this special issue explore the educational potential of both commercial and serious games, digital and analog, to support learning in diverse domains, from STEM to media literacy. The issue also addresses key challenges in GBL implementation, including the need for learning design skills, teacher training, and inclusive practices that respond to learner diversity. Contributions adopt a variety of methodologies, from experimental studies to critical reviews, and extend the field's scope by investigating underexplored topics such as biofeedback-based games and gender-related differences in gamification effectiveness. Taken together, the contributions emphasize the sheer variety of GBL approaches, while carefully considering how GBL should be employed to be effective.

KEYWORDS Game-Based Learning (GBL); Transversal Skills; Board Games; Video Games; Teacher Training.

SOMMARIO Il Game-Based Learning (GBL) è sempre più popolare in tutti i livelli scolari, offrendo approcci coinvolgenti ed esperienziali che promuovono l'apprendimento disciplinare e le competenze trasversali. Questa special issue esplora il potenziale educativo dei giochi commerciali e dei "serious games", in formato digitale e analogico, a supporto dell'apprendimento in diversi ambiti, dalle STEM alla media literacy. Il numero esamina le difficoltà legate all'implementazione del GBL, come la necessità di competenze nella progettazione didattica, di formazione degli insegnanti e di pratiche inclusive che rispondano alla diversità degli studenti. I contributi adottano una varietà di metodologie, da studi sperimentali a rassegne della letteratura, ed estendono il campo d'indagine esplorando temi poco trattati, come i giochi basati sul biofeedback o le differenze di genere nell'efficacia della gamification. Nel complesso, i contributi mettono in evidenza la varietà degli approcci al GBL, riflettendo su come il gioco debba essere impiegato per risultare davvero efficace.

PAROLE CHIAVE Game-Based Learning (GBL); Abilità Trasversali; Giochi da Tavolo; Videogiochi; Formazione Docenti.

1. Editorial

Game-based learning (GBL) has gained considerable traction in education, offering engaging and motivating experiences that promote active, experiential learning. Unlike traditional frontal instruction, GBL provides learners with meaningful contexts to develop both disciplinary knowledge and complex skills. This aligns with the recommendations of constructivist pedagogies to foster deeper, longer-lasting retention (Plass, Homer, & Kinzer, 2015; Rye, Sousa, & Sousa, 2025). In addition to its benefits for subject-specific learning, GBL is increasingly seen as a promising approach for promoting transversal and 21st century skills such as creativity, collaboration, critical thinking, and problem solving (Arnab & Walaszczyk, 2022; Arnab et al., 2021; Bermingham et al., 2013). While game- and play-based approaches have historically been associated with childhood education, we now see GBL interventions extending across all school levels and even to online and hybrid learning contexts (Silva, 2021).

Still, GBL faces several challenges. First, using games as learning tools requires careful design of the educational activity as well as familiarity with the medium of games (Passarelli et al., 2019). Second, teacher adoption remains uneven; for instance, research indicates relatively low acceptance among Italian teachers (Andreoletti, Tinterri, & Dipace, 2024). Importantly, practical constraints in terms of time, learning spaces, and school resources can make teachers apprehensive about trying GBL approaches in the classroom.

Another important aspect is the disproportionate academic attention given to digital games when compared to other game types, such as board games (Hwang & Chen, 2022). This point is especially relevant for this special issue. In 2019, the Italian Journal of Educational Technology published a special issue on digital games and learning (Dagnino, Passarelli, Perrotta, & Persico, 2019). The contributions to that issue were already quite varied in terms of

the type of games used, from immersive virtual reality games to gamified stress-management apps. Yet, the call for papers for that issue limited the scope to games with a digital component. Since then, we have observed a resurgence of tabletop games in popular culture, as well as a growing number of games mixing digital and analog components. This special issue aims to expand the focus of the previous one, exploring how both digital and non-digital games are being experimented and applied in formal educational contexts.

The special issue was conceived by the INSERT COIN commission of the Game Science Research Center (GSRC), an interdisciplinary group that connects Italian researchers and practitioners interested in understanding games and their impacts on all aspects of society, including learning. We are also grateful that one of our guest editors, Professor Sylvester Arnab from Coventry University (UK), could join us in this endeavor, so that the growing interest for game science in Italy could be more effectively linked to the wider efforts in the international research environment.

In selecting contributions, we aimed for diversity in game formats, research approaches, learning objectives, and learner populations. The six articles in this issue thus vary in their use of video games, board, and card games, repurposed commercial games, and gamified activities; yet, they share a common goal: to harness the potential of games for making learning experiences more engaging, effective, meaningful, and inclusive.

The issue is opened by a study from Toniolo, Inchingolo, Zanazzi, and Casu, focusing on GBL for STEM education. The study presents "COSMO HUNTERS," an analog card-based game designed to support middle-school students' learning of concepts related to the electromagnetic spectrum and astrophysics. In a quasi-experimental intervention the authors showed that, compared with a traditional approach, playing COSMO HUNTERS led to better retention after four weeks and a marked increase in student enjoyment. This study opens the issue by putting the spotlight on analog games' potential for learning, widening the focus when compared to the 2019 IJET special issue.

The second contribution, by Carenzio, Pasta, Contreras-Espinosa, Eguia-Gomez, Tymoshchuk, Antunes, Passos, and Proença presents multiple serious games for fostering the transversal skill of media literacy. The authors present the YO-MEDIA project, which entailed the design of two board games ("Social Media Puppeteers" and "Social Media Fake News") and a videogame ("Data Defenders"), all designed to promote media literacy among secondary school students. By engaging players in the production, deconstruction, and verification of information, these games introduce "pre-bunking" and "debunking" strategies. This contribution exemplifies how both tabletop and digital designs can be used not only for disciplinary learning, but also to successfully promote complex skills and competences beyond childhood education.

The third article, by Della Rocca, Scrocco, Pecini, Tarchi, and Bombonato also focuses on media literacy, but through the lens of reading comprehension and critical engagement with multiple texts. In their experimental study with the videogame "Elli's World," students in Grades 5 through 7 showed performance improvements in media literacy tasks over successive gameplay sessions. The study highlights potential drawbacks of GBL approaches, such as the possibility of fatiguing players after multiple playing sessions, and better rates of improvement for younger rather than older students. Critically, the study highlights that although teachers reported moderate satisfaction with the approach, they observed no changes in students' behavior. Therefore, this study represents a more critical voice within the issue when it comes to games for learning, which examines their effectiveness without shying away from considering potential drawbacks.

The fourth contribution, by Di Leo and Traetta, offers a review of the use of Minecraft, a commercial game that has long been integrated into educational settings within both early years and secondary classrooms. Unlike the other studies, this review examines the adoption of an off-the-shelf game and its repurposing as an educational tool, a markedly different approach from designing games from the ground up as purpose-built educational experiences. The authors' systematic review finds consistent evidence that Minecraft fosters spatial thinking, creativity, and engagement. Yet the authors emphasise that without teacher training and robust assessment frameworks, the potential benefits of such educational interventions often go unrealized. This underscores a recurrent message throughout this special issue: the need for educators to cultivate the requisite pedagogical design skills to optimally integrate the playful elements of popular games like Minecraft.

The fifth contribution, by Richter and Kickmeier-Rust, is a gender-focused exploration of gamification in the "Basketball Physics Challenge". Again, this study focuses on a different approach from the others, as gamification is the adoption and use of game elements in an environment that does not constitute a full-fledged game (Deterding, Dixon, Khaled, & Nacke, 2011). Importantly, the study highlights a critical issue of gameful approaches, that is, how they typically seem to engage males more than females. This crossover study, which involved secondary students, addresses the critical concern that using GBL for STEM teaching might inadvertently widen the gender gap. While it found no significant gender differences in overall performance, it did reveal distinct patterns in motivation and engagement. In particular, girls reported high engagement initially, which declined under gamified conditions, whereas boys showed a slight uptick in motivation. These findings serve as a reminder that "one-size-fits-all" solutions in game-based learning may fail to account for nuanced learner differences, and this approach should always be mindful of the learning context.

The closing article of the issue is a review on biofeedback-based games by Mercer and De Franches. This review maps a research domain more typically explored in therapeutic contexts, where such games serve as tools for emotional regulation and cognitive enhancement, and proposes extending biofeedback into teacher training. Adopting a critical disability studies lens, the authors argue that biofeedback mechanics can strengthen teachers' emotional well-being and reduce burnout. Their paper presents an uncommon, innovative, and promising game technology while stressing the importance of applying games not just to student education but also for directly supporting teachers in facing the complex demands of their job. We chose to close the issue with this forward-looking paper, as its unconventional approach suggests that many potential applications of games are yet unexplored.

We hope the articles in this issue inspire researchers and practitioners to further explore how best to leverage games for learning, while considering all game modalities and the wide variety of learning applications. We also encourage educators to further experiment with both analog and digital games, collaborate closely with researchers to measure impact, and share best practices for scaling GBL approaches in real classrooms.

Designing effective game-based interventions remains a challenging endeavor, requiring careful orchestration of learning goals, learners' tasks, personalization, and adaptation to the specific context, as well as ongoing reflections on learners' experiences. However, this special issue reaffirms that board and video games alike can foster learners' motivation and engagement, critical thinking, well-being, and disciplinary learning – making the learning design effort worthwhile.

2. Acknowledgements

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