Digital promise or digital fatigue?

THE POSITIVE AND NEGATIVE IMPACTS OF DIGITAL LEARNING TOOLS ON STUDENT ENGAGEMENT IN HIGHER EDUCATION SINCE 2020

Table of Contents

Introduction 2
Conceptualising Engagement 2
Digital Learning Tools in Higher Education 2
Virtual Learning Environments (VLEs): 2
Video Conferencing Platforms: 3
Collaborative Applications: 3
Gamification Systems: 3
Artificial Intelligence (AI): 3
Virtual and Augmented Reality (VR, AR): 3
Positive Impacts on Student Engagement 3
Negative Impacts on Student Engagement 4
Evidence and Contradictions 4
Methodological Critique 5
Gaps and Future Directions 5
Conclusion 5
References 6
Bibliography 7

Digital promise or digital fatigue? The positive and negative impacts of digital learning tools on student engagement in higher education since 2020

Introduction

Since 2020, higher education has experienced a shift toward digital learning technologies, accelerated by the Covid-19 pandemic and the rapid adoption of online platforms. Colleges and universities in the UK and beyond have implemented a variety of digital tools to support face to face teaching and in some cases replace it. Tools such as virtual learning environments, collaborative software, video conferencing and gamification systems have become popular, reshaping how students' access, interact and participate in higher education

Whether these tools work or not can be based on different metrics, outcomes, engagement or participation. Engagement is often seen as the critical factor, leading to increased outcomes for the rest. Fredricks, Blumenfeld and Paris (2004) provide a widely cited framework that defines engagement across three interrelated dimensions. Behavioural (participation and effort), cognitive (investment in learning and self-regulation) and emotional (interest, belonging and attitudes). This framework provides a useful lens for analysing how digital tools may support or hinder learning.

The increased adoption of digital tools has led to a diverse base of evidence. Although digital fatigue and access inequality are ongoing problems (Deng and Yang, 2025), other studies highlight the benefits of flexibility and collaboration (Akpen et al., 2024). This review aims to evaluate the positive and negative impacts of digital learning tools on student engagement in higher education since 2020.

Conceptualising Engagement

Student engagement has been described as a multifaceted construct that combines behavioural, cognitive and emotional dimensions. Fredricks, Blumenfeld and Paris (2004) provide one of the most widely used frameworks, defining behavioural engagement as visible participation in academic tasks and activities, cognitive engagement as the investment of effort in learning and use of self-regulation strategies and emotional engagement as students' sense of belonging. This model has been influential as it recognises that engagement is not limited to attendance or effort.

More recent models have expanded this definition. Bond and Bedenlier (2019) emphasise that in digital education, engagement also includes social and technological dimensions. They argue that engagement cannot be fully understood without considering the mediating role of learning platforms and communication tools, as these shape both interaction and community building. Similarly, Petty's (2015) work on active learning highlights the importance of participation and feedback, showing that students learn more effectively when they are actively involved in constructing meaning rather than passively receiving information.

Even with these definitions, measuring engagement remains a challenge. Many studies rely on surveys that try to capture the feelings of the students and these are open to bias. Others use analytics to record clicks or time spent on the platform. These tend to show participation but neglect cognitive and emotional engagement (Bergdahl et al., 2024). This complexity makes it important to examine not only whether digital tools increase activity but also how they influence motivation, persistence and deeper learning.

Digital Learning Tools in Higher Education

Virtual Learning Environments (VLEs):

Most common tools are Moodle and Blackboard, they allow for the distribution of resources, task setting, submission of assignments and monitoring of student progress. Engagement with VLEs is most often through analytics such as time spent, submissions made, or quizzes attempted.

Video Conferencing Platforms:

Platforms such as Zoom or Microsoft Teams became essential during the Covid-19 Pandemic and have remained in use after in person classes resumed. These tools allowed for teaching to continue during lockdown, though raised the issue of digital fatigue, with reduced participation over time and highlighted inequality of access (Akpen et al., 2024, Deng and Yang, 2025). A common problem reported by lecturers was teaching to blank screens and muted microphones, which limited interaction and reduced emotional engagement. From practice, it appears that requiring students to keep cameras and microphones active can mitigate these issues. In one teaching group, for example, encouraging visible participation supported a two-way conversation that was closer to classroom interaction. While anecdotal, this reflects wider arguments in the literature that sustained engagement depends on interaction and social presence rather than simply tool availability (Bond and Bedenlier, 2019).

Collaborative Applications:

Tools such as Padlet, Google Docs, or Microsoft Teams are often used alongside VLEs. They enable peer-to-peer learning and group work, providing opportunities for behavioural and social engagement.

Gamification Systems:

KnowItAllNinja, Duolingo and Codio introduce game-based elements such as points, badges, or leaderboards into learning environments. Studies since 2020 show that gamification can enhance motivation and participation, though critics highlight risks of superficial engagement and novelty effects (Bouchrika et al., 2021, Jack et al., 2024).

Artificial Intelligence (AI):

AI tools such as Mizou are increasingly being used as tutors or chatbots to provide support and feedback. They are also used to reinforce teaching and learning. They can track interactions between students and chatbots and generate reports.

Virtual and Augmented Reality (VR, AR):

These tools allow immersive simulations that can promote experiential learning. Early studies suggest they enhance emotional engagement and motivation, though cost and accessibility limit their widespread adoption (Geana, Cernusca and Liu, 2023).

Positive Impacts on Student Engagement

The adoption of digital tools in higher education has been widely reported to have a positive effect on student engagement. Reviews have highlighted improvements in accessibility, flexibility, collaboration and motivation. Alonso-Sánchez, López and González (2025) found that online learning technologies allowed students to engage with materials more flexibly, reducing barriers linked to time and location. This flexibility increased behavioural engagement, particularly for students with competing commitments. Similarly, Deng and Yang (2025) report that students valued the opportunity to re-watch lectures or access resources online, which supported both cognitive and emotional engagement by allowing learning to take place at an individual pace.

Collaboration tools such as Padlet and Google Docs have also been linked to higher levels of participation. They encourage peer to peer collaboration and active participation, giving a sense of community (Bond and Bedenlier, 2019). By facilitating real time contributions, these tools promote behavioural and cognitive engagement through shared knowledge.

Gamification has been particularly prominent in recent studies. Alnuaim (2024) demonstrate gamified digital literacy tasks led to significant improvements in both performance and student satisfaction, suggesting stronger behavioural and emotional engagement. Similarly, Alonso-Sánchez, López and González (2025) reported positive perceptions of gamification among large cohorts of undergraduates, with students noting that leaderboards and badges increased motivation and persistence. These studies confirm gamification's potential to enhance engagement, but they largely measure short term outcomes. Whether these effects persist over a full academic year remains unclear.

Immersive tools such as virtual and augmented reality also appear to enhance engagement. Geana, Cernusca and Liu (2023) compared video delivery with AR simulations, finding that students in the AR condition demonstrated higher levels of motivation and knowledge retention. The immersive nature of these environments seems to promote emotional engagement, making learning experiences more memorable.

Overall, the evidence suggests that digital tools can increase behavioural engagement by widening access and encouraging participation, cognitive engagement through personalised and flexible learning and emotional engagement by making activities more interactive and enjoyable. Most studies emphasise short term gains and there is less clarity about how sustained these positive effects are across a full academic year or within diverse student groups.

Negative Impacts on Student Engagement

Despite the reported benefits of digital learning tools, since 2020, there are also several highlighted negative impacts. Extended use of platforms such as Zoom and Microsoft Teams has been associated with declining participation and emotional disengagement (Akpen et al., 2024, Deng and Yang, 2025). Students frequently report reduced concentration during long sessions and have been noted to join a session just to turn off the camera and microphone. Some have even joined the session from their beds. Interactive features such as polls and breakout rooms can help, but they have not eliminated the wider risk of passive engagement.

Another concern is the digital divide. Although these digital tools are available on many different platforms, smartphone, table or PC, students may not have up to date hardware or those with poor or no internet connection are less able to participate. Akpen et al. (2024) emphasise that these disparities risk reinforcing existing social inequalities within higher education, particularly for students from disadvantaged backgrounds.

Tool overload is also reported. The simultaneous use of VLEs, collaboration app, video conferencing and gamification can overwhelm students. Using multiple platforms also introduces a steep learning curve that can impede engagement. This fragmentation of learning spaces has been linked to cognitive overload, reducing meaningful engagement rather than enhancing it (Bouchrika et al., 2021).

Gamification carries risks. In one statistics class, points and leaderboards increased participation at first, but engagement dropped once the novelty faded (Jack, Alexander and Jones, 2024). Similarly, Bouchrika et al. (2021) argue that gamification can produce short lived spikes in activity without translating into deeper learning outcomes. It can foster a competitive atmosphere to class learning but can also negatively affect those less able students, causing them to further decline.

Immersive technologies such as VR and AR face practical limitations. Geana, Cernusca and Liu (2023) acknowledge their potential to increase motivation, but also note high costs, limited availability and accessibility issues that restrict widespread adoption.

These findings demonstrate that while digital tools create opportunities for engagement, they also risk exclusion, fatigue and superficial interaction if not carefully designed and implemented.

Evidence and Contradictions

Most reviews agree that digital tools provide opportunities for greater accessibility, flexibility and participation (Akpen et al., 2024, Balalle, 2024). Students value being able to learn at their own pace and collaborate across platforms (Bond and Bedenlier, 2019). At the same time, surveys show that poor integration and overuse of these tools often lead to declining motivation and fatigue (Deng and Yang, 2025).

Findings on gamification are inconsistent. For some cohorts, gamified tasks boost motivation and persistence (Alonso-Sánchez, López and González, 2025). Yet classroom studies suggest these gains may be temporary, with activity dropping once novelty fades (Jack, Alexander and Jones, 2024). This pattern supports concerns that gamification can encourage surface-level participation without deeper learning (Bouchrika et al., 2021). The evidence indicates that gamification only

improves engagement when game elements are carefully aligned with learning objectives, not simply added as extras.

Methodological Critique

A large proportion of research relies on self-report surveys, which capture students' perceptions of motivation, satisfaction and participation. These methods are valuable for gauging emotional and cognitive engagement, but they are open to bias and may reflect what students think is expected rather than their actual behaviour (Akpen et al., 2024, Alonso-Sánchez, López and González, 2025).

Experimental and quasi-experimental designs provide stronger evidence of causal impact. Alnuaim (2024), for example, used a randomised controlled trial to show that gamification significantly improved performance and satisfaction in a digital literacy course.

Learning analytics has become an increasingly common method, using data such as log-ins, clicks, or time spent on virtual learning environments. This provides objective, large-scale data, but it is heavily weighted toward behavioural indicators while neglecting cognitive and emotional dimensions of engagement (Bergdahl et al., 2024).

Case studies and qualitative approaches, such as those used by Jack, Alexander and Jones (2024) provide rich insights into how tools are experienced in context.

Gaps and Future Directions

Although the evidence base on digital learning tools and engagement has grown rapidly since 2020, several gaps remain. One major limitation is the shortage of longitudinal research. Many studies capture engagement over weeks or a single semester, but few examine sustained effects across full programmes or multiple academic years. This makes it difficult to judge whether tools such as gamification or VR lead to lasting improvements rather than short-term novelty effects (Bouchrika et al., 2021).

A second gap concerns inclusivity and equity. While some research acknowledges the digital divide, there is limited focus on how engagement varies across different demographic groups, including gender, socio-economic background and disability. Alnuaim (2024) notes gender differences in response to gamified systems, suggesting that outcomes may not be evenly distributed.

Finally, gamification stands out as a promising but contested area. Evidence shows clear motivational benefits but also risks of superficial engagement if poorly designed.

Conclusion

Since 2020, digital learning tools have reshaped higher education by enabling new ways for students to access and participate in learning. The literature highlights clear positive impacts, including increased flexibility, opportunities for collaboration and motivational benefits, particularly through gamification and immersive technologies. At the same time, studies identify significant drawbacks such as digital fatigue, inequality of access, tool overload and the risk of superficial engagement. Contradictions in the evidence often stem from methodological differences, with surveys, analytics and case studies each offering partial insights. The effectiveness of digital tools is not automatic, it relies on how well they are designed and integrated into teaching.

References

Akpen, M.S., Asaolu, O.S., Atobatele, A. and Agbaje, O. (2024) 'Impact of online learning on student's performance and engagement: a systematic review', *Discover Education*, 2(1), pp. 1–18. Available at: https://doi.org/10.1007/s44217-024-00253-0 (Accessed: 9 September 2025).

Alonso-Sánchez, J.M., López, M. and González, J. (2025) 'Gamification in higher education: a case study in educational sciences', *TechTrends*. Available at: https://doi.org/10.1007/s11528-025-01056-2 (Accessed: 9 September 2025).

Alnuaim, A. (2024) 'The impact and acceptance of gamification by learners in a digital literacy course: pre-post intervention study', *JMIR Serious Games*, 12(1), e52017. Available at: https://doi.org/10.2196/52017 (Accessed: 9 September 2025).

Balalle, H. (2024) 'Exploring student engagement in technology-based education in relation to gamification, online/distance learning, and other factors: a systematic literature review', Social Sciences & Humanities Open, 9, 100870. Available at: https://doi.org/10.1016/j.ssaho.2024.100870 (Accessed: 9 September 2025).

Bergdahl, N., Fors, U., Knutsson, O., Liljedahl, M. and Hernández, R. (2024) 'Unpacking student engagement in higher education learning analytics: a systematic review', *International Journal of Educational Technology in Higher Education*, 21(1), p. 49. Available at: https://doi.org/10.1186/s41239-024-00493-y (Accessed: 9 September 2025).

Bond, M. and Bedenlier, S. (2019) 'Facilitating student engagement through educational technology: towards a conceptual framework', *Journal of Interactive Media in Education*, 2019(1), p. 11. Available at: https://doi.org/10.5334/jime.528 (Accessed: 9 September 2025).

Bouchrika, I., Harrati, N., Wanick, V. and Wills, G. (2021) 'Exploring the impact of gamification on student engagement and involvement with e-learning systems', *Interactive Learning Environments*, 29(8), pp. 1244–1257. Available at: https://doi.org/10.1080/10494820.2019.1623267 (Accessed: 9 September 2025).

Deng, Z. and Yang, L. (2025) 'Exploring the impact of online education on student engagement in higher education in the post-COVID-19 era', *Frontiers in Psychology*, 16, 1574886. Available at: https://doi.org/10.3389/fpsyg.2025.1574886 (Accessed: 9 September 2025).

Fredricks, J.A., Blumenfeld, P.C. and Paris, A.H. (2004) 'School engagement: potential of the concept, state of the evidence', *Review of Educational Research*, 74(1), pp. 59–109. Available at: https://doi.org/10.3102/00346543074001059 (Accessed: 9 September 2025).

Geana, I., Cernusca, D. and Liu, L. (2023) 'Beyond the dawn of virtualized learning environments: a comparative study of video and augmented reality delivery on student engagement and knowledge retention', *Journal of Computer Assisted Learning*, 39(5), pp. 1311–1327. Available at: https://doi.org/10.1111/jcal.12890 (Accessed: 9 September 2025).

Jack, E., Alexander, C. and Jones, E.M. (2024) 'Exploring the impact of gamification on engagement in a statistics classroom', *Information and Inference: A Journal of the IMA*. Available at: https://doi.org/10.1093/teamat/hrae009 (Accessed: 9 September 2025).

Petty, G. (2015) *Teaching today: a practical guide*. 5th edn. Oxford: Oxford University Press.

Bibliography

Baah, C., Govender, I. and Subramaniam, Y. (2024) 'Enhancing learning engagement: a study on gamification's influence on motivation and cognitive load', *Education Sciences*, 14(10), p.1115. Available at: https://doi.org/10.3390/educsci14101115 (Accessed: 9 September 2025).

Fan, L., Yang, C. and Fraser, S.P. (eds.) (2023) Embracing online pedagogy: the new normal for higher education. Basel: MDPI. Available at: https://doi.org/10.3390/books978-3-0365-8623-6 (Accessed: 9 September 2025).

Ferrer, F., Ringer, A., Saville, K., Sáinz, J. and Cebrián, D. (2020) 'Students' motivation and engagement in higher education: the importance of attitude to online learning', *Higher Education*, 80(1), pp. 35–55. Available at: https://doi.org/10.1007/s10734-020-00657-5 (Accessed: 9 September 2025).

Ghai, S. and Tandon, A. (2023) 'Integrating gamification and instructional design to enhance usability of online learning', *Education and Information Technologies*, 28, pp. 6579–6596. Available at: https://doi.org/10.1007/s10639-022-11202-5 (Accessed: 9 September 2025).

Halachev, P. (2024) 'Gamification as an e-learning tool: a Literature Review', E-Learning Innovations Journal, 2(2), pp. 4-20. Available at: https://doi.org/10.57125/ELIJ.2024.09.25.01 (Accessed: 9 September 2025).

Johnston, R., Griffin, A., Manolopoulou, I. and Ferreira, J. (2024) 'Uncovering student engagement patterns in Moodle with interpretable machine learning', *arXiv preprint*. Available at: https://arxiv.org/abs/2412.11826 (Accessed: 9 September 2025).

Mystakidis, S. (2024) 'Distance education gamification in social virtual reality: a case study on student engagement', in 2024 IEEE Global Engineering Education Conference (EDUCON), Kos, Greece, 8–11 April. Piscataway: IEEE, pp. 1–10.

Qian, Y. (2008) 'Learning in 3-D virtual worlds: rethinking media literacy', *International Journal of Learning*, 14(9), pp. 201–208.

Rafiq, M., Iqbal, S. and Afzal, M.T. (2024) 'The impact of digital tools and online learning platforms on higher education learning outcomes', International Journal of Emerging Technologies in Learning, 19(9), pp. 87–101.

Triantafyllou, S., Chytas, D. and Perifanou, M. (2025) 'Gamification in education and training: a literature review', *International Review of Education*, 71(2), pp. 239–262. Available at: https://doi.org/10.1007/s11159-024-10111-8 (Accessed: 9 September 2025).