ASCILITE 2024

Navigating the Terrain:

Emerging Frontiers in Learning Spaces, Pedagogies, and Technologies

Level up: Unlocking student engagement through gamification

Bruce Mitchell, Mary Jesselyn Co
Monash University

This study explores the impact of gamification on student engagement in a first-year Managerial Communication unit at a large Australian university. Gamified elements such as points and leaderboards were integrated into online and classroom activities, aiming to enhance academic, cognitive, social, and affective engagement. Using a quasi-experimental design, the study employed pre- and post- gamification surveys and thematic analysis of student reflections. Results indicated significant improvements in cognitive engagement and social engagement with teachers, with students reporting increased motivation and satisfaction. While academic and social engagement with peers showed no significant differences, qualitative data revealed that competition and rewards fostered a sense of achievement and collaboration. These findings align with existing literature, suggesting that gamification can create a more interactive and supportive learning environment. This study contributes to the growing evidence on the efficacy of gamification in education.

Keywords: gamification, student engagement, higher education, academic, cognitive, social, affective

Introduction

Gamification uses “game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems” (Kapp, 2012, p.10). It is the “use of game design elements in non-game contexts” (Dicheva et al., 2015). In educational contexts, gamification is used to enhance learning experiences by making them more interactive and engaging. It can lead to increased motivation (Qiao et al., 2022), engagement (Raju et al., 2021), and retention of information among students (Qiao et al., 2022). Gamified systems also provide immediate feedback on student performance and fosters a growth mindset (Dichev & Dicheva, 2017). Game-like environments can create a more relaxed atmosphere where students feel safe to take risks and make mistakes. This reduction in anxiety can encourage participation and exploration, as students are less fearful of negative consequences (Sanchez et al., 2020; Bouchrika et al., 2021).

Literature Review

Research has consistently shown a positive relationship between student engagement and various learning outcomes, including academic performance, cognitive development, and student satisfaction (Zhoc & Webster, 2019). Gamification increases engagement through several mechanisms.

Academic engagement
Gamification can enhance academic engagement by incorporating game elements that motivate students to participate actively in learning activities. For instance, the use of points, badges, and leaderboards can encourage students to attend classes, complete assignments, and engage with course materials (Seaborn & Fels, 2015). Academic engagement refers to observable behaviours directly related to the learning process, such as class attendance, preparation for class, and persistence in study (Zhoc & Webster, 2019). It is essential for achieving the minimum threshold level of learning and is linked to higher academic achievement. However, the effectiveness of gamification in promoting academic engagement can vary based on context and individual differences. Some studies indicate that while gamification may initially boost motivation, it may not always lead to sustained academic engagement or improved academic performance (Seaborn & Fels, 2015).

Cognitive engagement
While academic engagement is important, cognitive engagement—defined as the psychological investment in learning and understanding complex ideas—has been identified as a key factor for academic success (Zhoc &

Webster, 2019). It emphasizes the need for students to be intellectually inspired and motivated to exceed minimum study requirements. Gamification has been linked to increased cognitive engagement by encouraging students to invest more effort in understanding complex concepts. Game mechanics can stimulate critical thinking and problem-solving skills, as students are often required to strategize and apply knowledge in gamified environments (Sanchez et al., 2020; Ding et al., 2018; Zhoc & Webster, 2019).

Social engagement with teacher

Gamified learning environments can also enhance social engagement with teachers by creating more interactive and dynamic classroom experiences. Teachers can use gamification to provide immediate feedback and recognition, which can strengthen the student-teacher relationship, fostering a supportive learning atmosphere (Seaborn & Fels, 2015). Social engagement refers to the interaction with teaching staff, which takes place in the academic sphere of the institution. Research evidence show that student-faculty relationships are critical to the improvement of student learning and development (Guenther & Miller, 2011).

Social engagement with peers

On the other hand, social engagement with peers refers to the interaction with friends and peers who offer informal support to students. In fact, peers are considered the single most critical source of influence as they affect almost all aspects of development, including cognitive, affective, psychological and behavioural (Thomas, 2012). Gamification creates healthy competition that encourages students to strive for excellence while fostering a sense of community through collaboration among peers (Raju et al., 2021; Bouchrika et al., 2021). However, the impact on GPA can be mixed, as increased social engagement through gamified activities can detract from study time, potentially leading to lower academic performance (Zhoc & Webster, 2019).

Affective engagement

Gamification positively influences affective engagement by making learning more enjoyable and motivating. Affective engagement relates to a level of emotional response characterised by feelings of involvement in the institution as a place and a set of activities worth pursuing (Finn & Zimmer, 2012). Research into the significance of affective connections at school has examined students' sense of belonging, identification with school and sense of relatedness, which are factors influential to student motivation and participatory behaviours (Appleton et al., 2008). The incorporation of game elements can lead to increased interest and enjoyment in learning activities, which are crucial for emotional investment in education (Ding et al., 2018; Seaborn & Fels, 2015). Studies show that when students feel a sense of achievement through gamified elements, their overall satisfaction with the learning experience increases, which can lead to higher levels of affective engagement (Seaborn & Fels, 2015).

Methodology

The study was implemented in the first year Managerial Communication (MGF1100) unit at a large Australian University in semester 2 2023. Ethics approval was obtained from the University Human Research Ethics Committee (Project ID: 39370). The project team gamified the online content and classroom activities in weeks 5-8. Gamification elements such as conditional activities, progress bar and leaderboards were integrated in Moodle. During the gamified weeks, the completion of Moodle online activities earned students points which they accumulated for their team. In the classroom, student teams had to complete challenges which included tasks that apply the specific knowledge and skills in managerial communication. Completing the in-class challenges earned the team points which was reflected in the leaderboard. The top team for the semester received prizes and had their photo displayed in Moodle.

The research used a quasi-experimental design specifically using the pre- and post-test evaluation of the gamification intervention. All students enrolled in the unit were invited to complete the pre-gamification survey and the post-gamification survey via an email in week 4 and week 8. The survey used the Higher Education Student Engagement Scale (HESES) (Zhoc & Webster, 2019). It includes 28 items broken down into

the following subscales: academic engagement, cognitive engagement, social engagement with tutor, social engagement with peers, and affective engagement.

Independent samples T-tests were calculated to determine whether there are significant differences between the response's pre-gamification (week 4) and post-gamification (week 8). Students were asked to write a reflection on their gamification experience as part of their group report submission. These reflections were extracted, and a thematic analysis was conducted to identify how students perceive their gamification experience in relation to engagement. To prevent students from writing overly positive or insincere reflections, the assessment brief had clear set expectations of the value of honesty and thoughtful evaluation and provided specific prompts/guiding questions that encouraged critical thinking by asking students to reflect on both the strengths and areas for improvement in applying gamification in teaching managerial communication.

Results and Discussion

A total of 665 students responded to the questionnaire, with 410 students (62%) completing it before the gamification intervention, and 255 students (38%) completing it post intervention. To test the hypothesis that there are significant differences between the pre-Gamification and post-Gamification activities, an independent sample t-test was performed. Levene's test was performed to determine homogeneity of variances due to unequal sample sizes (Field, 2024). Results indicated that both groups were sufficiently normal for t-test analysis. For all five variables (academic engagement, cognitive engagement, social engagement with teachers, social engagement with peers, and affective engagement), Levene's test showed equal population variances ($p > .05$). Comparison of these variables between the two groups using t-tests yielded significant results on several variables.

Table 1
Comparison of pre- and post-gamification on student engagement variables

Variables	Levene's F	Sig.	t-test	df	*p*	*Cohen's D*
Academic Engagement	.069	.793	-1.165	632	.244	6.19
Cognitive Engagement	.424	.515	-2.798	639	**.005**	4.57
Social Engagement with Teachers	.085	.771	-3.037	634	**.002**	4.43
Social Engagement with Peers	2.249	.134	-1.574	632	.116	9.87
Affective Engagement	.165	.684	-.898	632	.369	5.28

On the variable ***academic engagement,*** the results indicate **NO significant** difference between the two groups, the pre-gamification (M = 41.28, SD = 6.18) and post-gamification group (M = 41.87, SD = 6.21), [t (632) = -1.165, p = .224, d = 6.19]. The 95% confidence interval of the difference between means ranged from [-1.58299 to -.40391] and did not indicate a difference between the means of the sample. The results show that for only one item under this variable (I usually come to class having completed readings or assignments), there was significant difference in the means (Mean $_{Pre}$ = 4.64; Mean $_{Post}$ = 4.88) between the two groups.

On the variable ***cognitive engagement***, the results indicate **significant difference** between the two groups, the pre-gamification (M = 18.08, SD = 4.51) and post-gamification group (M = 19.12, SD = 4.66), [t (639) = -2.798, p = .005, d = 4.57]. The 95% confidence interval of the difference between means ranged from [-1.76831 to -.30992) and did not indicate a difference between the means of the sample. The results show that there was significant difference in the means between the groups on three of the four items. These questions include: *I enjoy the intellectual challenge of courses I am studying* (Mean $_{Pre}$ = 4.87; Mean $_{Post}$ = 5.09); I *get a lot of satisfaction from studying* (Mean $_{Pre}$ = 4.38; Mean $_{Post}$ = 4.68), and *I am usually motivated to study* (Mean $_{Pre}$ = 4.05; Mean $_{Post}$ = 4.40). On all the items, the post gamification group had a higher mean score for all questions.

On the variable ***Social engagement with teachers,*** the results indicate a **significant difference** between the two groups, the pre-gamification (M = 19.09, SD = 4.40) and post-gamification group (M = 20.19, SD = 4.48), [t (634) = -3.037, *p* = .002, d = 4.43]. The 95% confidence interval of the difference between means ranged from [-1.80898 to -.38836) and did not indicate a difference between the means of the sample. The results show that there was significant difference in the means between the groups on all items. These questions include: *Staff make a real effort to understand difficulties I may have in my work (*Mean $_{Pre}$ = 4.62; Mean $_{Post}$ = 4.94); *Academic staff take an interest in my progress (*Mean $_{Pre}$ = 4.47; Mean $_{Post}$ = 4.74); *Teaching staff usually give helpful feedback on my progress (*Mean $_{Pre}$ = 4.80; Mean $_{Post}$ = 5.12); and *Staff are usually available to discuss my work (*Mean $_{Pre}$ = 5.19; Mean $_{Post}$ = 5.49); On all the items, the post gamification group had a higher mean score for all questions.

On the variable ***Social engagement with peers,*** the results indicate **NO significant difference** between the two groups, the pre-gamification (M = 31.82, SD = 9.53) and post-gamification group (M = 33.09, SD = 10.41), [t (632) = -1.574, *p* = .116, d = 9.87]. The 95% confidence interval of the difference between means ranged from [-2.86196 to -.31506) and did not indicate a difference between the means of the sample. The results show that there was significant difference in the means between the groups on only one item. This question was: *I am involved in university extracurricular activities* (Mean $_{Pre}$ = 2.84; Mean $_{Post}$ = 3.25).

Lastly, on the variable ***affective engagement, t***he results indicate **NO significant difference** between the two groups, the pre-gamification (M = 18.40, SD = 5.52) and post-gamification group (M = 18.79, SD = 5.37), [t (632) = -.898, *p* = .369, d = 5.287]. The 95% confidence interval of the difference between means ranged from [-1.23646 to -.46024) and did not indicate a difference between the means of the sample.

Thematic analysis of student reflections provided insight into the impact of gamification on various aspects of engagement. The results are categorised into academic engagement, cognitive engagement, social engagement, and affective engagement, aligning with the literature findings.

Students reflected positively on the impact of gamification on their **academic engagement**. They noted the use of the points and leaderboards motivated them to attend classes, regularly, complete the assignments and participate actively in learning activities. One group noted, *"Competition and rewards… were helpful in motivating and boosting our engagements and efforts… the marshmallow challenge utilised the healthy competition system… These rewards and competitiveness provide a sense of achievement and incentivize continued participation (T8 G1)*." This aligns with research indicating that gamification elements competition can increase motivation and engagement in academic settings (Zhoc & Webster, 2019; Seaborn & Fels, 2015).

Cognitive engagement involves the investment in learning tasks that require higher order thinking. Participants reported that gamification facilitated active learning and critical thinking - *"Gamification places learners in active scenario-based roles, forcing them to apply, adapt, and critically appraise academic principles in context. This active participation promotes a deeper, more layered understanding (T11 G4)."* This supports the notion that gamification requires students to use higher order thinking skills (Sanchez et al., 2020; Ding et al., 2018).

Gamification also enhances **engagement with the teacher**. One team remarked, *"The gamification elements allowed for more dynamic interactions with our instructor, who provided immediate feedback and recognition... This made the learning process more engaging but also helped build a stronger student-teacher relationship (T3 G2)."* This highlights the role of gamification in creating a supportive learning environment, where teachers actively engage with students, and foster an interactive classroom (Seaborn & Fels, 2015).

The importance of teamwork and collaboration was a recurring theme. One group reflected, *"Through teamwork, the gamification activities allowed us to actively see where we failed or succeeded in our use of collaboration and communication (T3 G5)"*, evidencing gamification fostering **social engagement between peers** while competition pushed students to do better (Raju et al., 2021; Bouchrika et al., 2021). A group

notes, *"When individuals are pitted against each other in a friendly contest… this competitive edge fosters a heightened level of engagement as participants strive to outperform one another (T5 G2)."*

Participants expressed that gamification improved **affective engagement** and made learning enjoyable. One group pointed, *"The inherent enjoyment of gamified activities motivated us to invest time and effort in mastering managerial communication concepts (T3 G6)."* The gamified elements of the activities led to increased enjoyment and learning (Ding et al., 2018; Seaborn & Fels, 2015).

Conclusion

The integration of gamification into educational contexts has demonstrated significant potential in enhancing various dimensions of student engagement. This research found that gamified elements such as competition, rewards and interactive challenges positively influenced academic, cognitive, social and affective engagement. Elements like competition and rewards boost participation and motivate achievement, while interactive scenarios enhance critical thinking. These findings align with existing literature on the benefits of gamification in education However, it's important to note that while gamification showed clear benefits, its implementation should be thoughtful and aligned with learning objectives. The lack of significant change in some areas, such as academic engagement, indicates that gamification is not a panacea and should be part of a broader, well-rounded educational strategy. Future research could explore the long-term effects of gamification on academic performance and engagement, as well as investigate how different types of gamified elements impact various aspects of the learning experience. Additionally, studies across different disciplines and educational levels could provide insights into the broader applicability of these findings.

References

Appleton, J. J., Christenson, S. L., & Furlong, M. J. (2008). Student engagement with school: Critical conceptual and methodological issues of the construct. *Psychology in the Schools, 45*(5), 369–386. https://psycnet.apa.org/doi/10.1002/pits.20303

Bouchrika, I., Harrati, N., Wanick, V., & Wills, G. (2019). Exploring the Impact of Gamification on Student Engagement and Involvement with e-learning Systems. *Interactive Learning Environments*, *29*(8), 1–14. https://doi.org/10.1080/10494820.2019.1623267

Dichev, C., & Dicheva, D. (2017). Gamifying education: What is known, what is believed and what remains uncertain: A critical review. *International Journal of Educational Technology in Higher Education*, *14*(1). https://doi.org/10.1186/s41239-017-0042-5

Dicheva, D., Dichev, C., Agre, G. & Angelova, G. (2015). Gamification in education: A systematic mapping study. *Journal of Educational Technology & Society, 18*(3), 75-88. https://www.jstor.org/stable/jeductechsoci.18.3.75

Ding, L., Er, E., & Orey, M. (2018). An exploratory study of student engagement in gamified online discussions. *Computers & Education*, *120*, 213–226. https://doi.org/10.1016/j.compedu.2018.02.007

Finn, J. D., & Zimmer, K. S. (2012). Student engagement: What is it? Why does it matter? In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement*. New York: Springer. https://doi.org/10.1007/978-1-4614-2018-7_5

Guenther, C. L., & Miller, R. L. (2011). Factors that promote student engagement. In R. L. Miller, E. Amsel, B. M. B. Kowalewski, B. C., K. D. Keith, & B. F. Peden (Eds.), *Promoting student engagement—Volume 1: Programs, techniques and opportunities*. Retrieved from http://teachpsych.org/ebooks/pse2011/vol1/

Kapp, K.M. (2012). *The gamification of learning and instruction: game-based methods and strategies for training and education*. San Francisco: Pfeiffer. https://doi.org/10.1145/2207270.2211316

Qiao, S., Yeung, S. S., Zainuddin, Z., Ng, D. T. K., & Chu, S. K. W. (2022). Examining the effects of mixed and non-digital gamification on students' learning performance, cognitive engagement and course satisfaction. *British Journal of Educational Technology*, *54*(1), 1–20. https://doi.org/10.1111/bjet.13249

Raju, R., Bhat, S., Bhat, S., D'Souza, R., & Singh, A. B. (2021). Effective usage of gamification techniques to boost student engagement. *Journal of Engineering Education Transformations*, *34*(0), 713–717. https://doi.org/10.16920/jeet/2021/v34i0/157171

Sanchez, D. R., Langer, M., & Kaur, R. (2020). Gamification in the classroom: Examining the impact of gamified quizzes on student learning. *Computers & Education*, *144*(144), 103666. https://doi.org/10.1016/j.compedu.2019.103666

Seaborn, K., & Fels, D. I. (2015). Gamification in theory and action: A survey. *International Journal of Human-Computer Studies*, *74*(1), 14–31. https://doi.org/10.1016/j.ijhcs.2014.09.006

Thomas, L. (2012). Building student engagement and belonging in higher education at a time of change: Final report from the What works? Student retention and success programme. Retrieved from The Higher Education Academy website: https://www.advance-he.ac.uk/knowledge-hub/building-student-engagement-and-belonging-higher-education-time-change-final-report

Zhoc, K. C. H., Webster, B. J., King, R. B., Li, J. C. H., & Chung, T. S. H. (2018). Higher education student engagement scale (HESES): Development and psychometric evidence. *Research in Higher Education*, *60*(2), 219–244. https://doi.org/10.1007/s11162-018-9510-6

Mitchell, B., & Co, M.J. (2024). Level up: Unlocking student engagement through gamification. In Cochrane, T., Narayan, V., Bone, E., Deneen, C., Saligari, M., Tregloan, K., Vanderburg, R. (Eds.), *Navigating the Terrain: Emerging frontiers in learning spaces, pedagogies, and technologies*. Proceedings ASCILITE 2024. Melbourne (pp. 561-566). https//doi.org/10.14742/apubs.2024.1350

Note: All published papers are refereed, having undergone a double-blind peer-review process.