

Maximising Attendance in Higher Education: How AI and Gamification Strategies Can Boost Student Engagement and Participation

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Abstract

The decline in student attendance and engagement in Higher Education (HE) is a pressing concern for educational institutions worldwide. Traditional lecture-style teaching is no longer effective, and students often become disinterested and miss classes, impeding their academic progress. While Gamification has improved learning outcomes, the integration of Artificial Intelligence (AI) has the potential to revolutionize educational experience. The combination of AI and Gamification offers numerous research opportunities and paves the way for updated academic approaches to increase student engagement and attendance. Extensive research has been conducted to uncover the correlation between student attendance and engagement in HE. Studies consistently reveal that regular attendance leads to better academic performance.

On the other hand, absenteeism can lead to disengagement and poor academic performance, stunting a student's growth and success. This position proposes integrating Gamification and AI to improve attendance and engagement. The approach involves incorporating game-like elements into the learning process to make it more interactive and rewarding. AI-powered tools can track student progress and provide personalized feedback, motivating students to stay engaged. This approach fosters a more engaging and fruitful educational journey, leading to better learning outcomes. This position paper will inspire further research in AI-Gamification integration, leading to innovative teaching methods that enhance student engagement and attendance in HE.

Keywords: Student Attendance, Student Engagement, Higher Education, Gamification, and Artificial Intelligence.

1 Introduction

Reduced attendance in Higher Education (HE) has been subject to extensive research by academics. Empirical evidence suggests a direct correlation between consistent attendance and enhanced learning experiences, highlighting concerns about the detrimental effects of low attendance on student engagement and performance [1]. Consistent attendance is essential for intellectual engagement, enabling students to comprehend the presented material [2]. Student absenteeism and lack of motivation are prevalent issues that impede the educational process and limit students' career opportunities [3, 4]. However, low attendance can pose significant challenges to HE institutions, as highlighted by past research [5, 6, 7]. While some institutions have flexible attendance policies that give students the autonomy to attend lectures as they wish [8, 9], motivating students is a crucial strategy to increase attendance rates. Motivated students are more likely to attend classes regularly and achieve better academic results [4]. Student engagement in HE involves activities, behaviours, and attitudes crucial for academic, personal, and social development [10].

Effective learning depends on student engagement, encompassing cognitive, affective, social, and communicative aspects like focus, collaboration, effort, and clear expression [11]. Active participation, peer interaction, and essential skills for success in HE and beyond are also necessary [12]. HE institutions should create an interactive learning environment that fosters meaningful interactions to support student development and promote academic achievement [13].

Recent studies have found a correlation between HE attendance and academic performance [14, 15, 16]. While attendance still significantly impacts students' academic performance [15], adopting a multi-dimensional approach is critical to comprehend the factors contributing to reduced student engagement [16]. Some scholars have suggested that institutional prestige and instructor charisma are essential factors in promoting student participation, with engagement levels directly linked to these variables [17, 18]. Active engagement is vital to achieve academic success [18]. How learning platforms and courses are designed and structured is crucial in determining students' paths on their educational journey [19]. Employing flexible and adaptable pedagogical strategies is necessary to ensure every student can access a rich and rewarding educational experience [13]. Advancements in technology and teaching methods offer more effective learning opportunities, leading to better education [20].

This position paper proposes an innovative solution to address low engagement and attendance rates in traditional lecture-based Education. By combining cutting-edge technological strategies with conventional teaching methodologies, this initiative aims to elevate the traditional lecture experience and promote more productive and efficient learning outcomes. With this project, we aim to answer the following research question: *How can we solve the lack of student engagement in Higher Education through technology, and how does it affect attendance?*

This paper is divided into four chapters, including this one. The initial chapter, "Introduction", analyses the connection between class attendance and student engagement in HE. The second chapter delves into the transformative influence of Gamification and AI in Education. It highlights their ability to enhance student engagement, motivation, and academic performance. The third chapter explains the methodology to support the research, providing a detailed account of adopting the Design Science Research methodology and explaining what will be done under the six phases. Finally, the last chapter presents a comprehensive discussion and conclusion, addressing all assumptions and limitations and providing details about future extensions of the current work, bringing together all the key findings.

2 Preliminary Literature Review

2.1 Gamification in Education

Gamification involves adding game-based elements to non-gaming settings to increase engagement and motivation. This technique turns mundane activities into interactive experiences by introducing a game-like structure that rewards sustained efforts and recognises positive contributions [21]. In Education, Gamification blends enjoyable and intriguing game aspects with structured educational environments. Integrating technology in teaching and learning significantly enhances course participation and engagement [16]. An in-depth survey of recent academic research in art studies highlights Gamification as a critical strategy for amplifying motivation within academic spheres [4, 19]. The upward trajectory of Gamification in the educational sector is progressively apparent, attributed to its potential to integrate game-like attributes into instructional frameworks [19] fluidly. This assimilation is anchored by the ambitious goal of amplifying student motivation and ensuring deeper immersion in their educational journey.

In a literature review conducted by Kalogiannakis et al. [22], it was found that many articles lacked a solid theoretical foundation. Only a few incorporated established models, such as intrinsic motivation, engagement, and challenge psychology, and principles for goal setting and achievement. The study also revealed that gamified science education settings often included game-like elements, such as leaderboards, points, and levels. Meanwhile, a comprehensive study by van Roy and Zaman [23] explored the impact of game design elements in technology-supported learning environments on fulfilling students' basic psychological needs. The research concluded that incorporating game design elements significantly enhances students' feelings of autonomy, relatedness, and competence. It also highlights that the effectiveness of Gamification in educational motivation is contextual and dependent on situational and cultural factors. These groundbreaking findings offer valuable insights into the efficacy of Gamification, which previously generated mixed results. The study underscores the importance of considering basic psychological needs when designing gamified learning experiences to maximise their motivational impact.

While the positive impacts of Gamification are evident across diverse learning contexts [19, 20], it is essential to continue emphasising the need for innovative enhancements and the adoption of advanced tools to refine its instructional effectiveness further [9]. HE institutions are grappling with low student engagement and frequent absenteeism; this issue has a notable impact on academic performance, particularly in courses that require greater theoretical rigour. The objective is to devise effective strategies to reignite students' interest and elevate educational outcomes [19].

Gamification has proven to be a highly effective tool in enhancing the learning experience [20]. Studies have consistently shown that implementing Gamification in educational settings significantly impacts students' motivation levels [19, 20]. Incorporating Gamification techniques into attendance tracking can increase student engagement and promote a healthy sense of competition. Notably, the influence of Gamification transcends classroom boundaries, fostering an academic rigour that correlates with overall educational achievement [19]. Although Gamification has proven effective, it is essential to recognise that Education is constantly changing; educators must continue to innovate their teaching strategies to ensure that students remain interested and engaged in the learning process.

2.2 AI's Role in Revolutionizing Gamification in Education

The emergence of AI technology is revolutionising various industries across the globe. In particular, the customer service sector is benefiting from integrating chatbots and virtual assistants, which enhance communication with clients and optimise operational efficiency. AI holds immense promise for tackling some of the most intricate issues faced by humankind and is widely recognised as a symbol of advancement [24]. AI is a revolutionary technology that enables machines to imitate human cognitive abilities, including learning, reasoning, problem-solving, perception, and language comprehension [25].

In Education, instructors need to share their perspectives as we continue to navigate the educational and ethical ramifications of integrating AI into higher learning [26]. AI is an essential tool for enhancing Education through data analysis and Gamification. Its capabilities are widely recognised and continually evolving. By identifying behavioural patterns and significant errors, AI allows educators to personalise their approach to each student's unique needs, reinvigorating motivation and engagement [27]. Integrating AI with Gamification in the HE domain could be a game-changer, directly addressing the issue of student engagement. The limited research on this integration underscores its novelty and potential to pave the way for further academic inquiries. As such, exploring this AI-Gamification blend is not only innovative but also holds the potential to inspire subsequent research and the adoption of modernised strategies in academia. The vast capabilities of AI can unlock truly personalised, interactive, and ultimately successful learning experiences [26]. AI-augmented gamified systems hold the potential to deliver tailored educational experiences. By continuously monitoring students' interactions and performance, these systems can identify individual strengths, preferences, and areas of challenge [27]. However, a review of AI in Education (AIEd) research by Crompton and Burke [26] revealed six significant gaps in the field. These gaps include a lack of research in developing nations, a concentration of studies in specific fields such as language learning, computer science, and engineering, and a growing involvement of education faculties in AIEd research. The review also notes a focus on undergraduate studies, a lack of research on AIEd's ability to assist instructors and managers, and a need to explore new applications of AIEd. The review recommends exploring new tools like ChatGPT while acknowledging certain limitations, such as excluding non-English research and reliance on peer-reviewed journals. There is a surging interest in creating game-based or gamified AI educational robotics (AIERs) to promote student participation and improve learning efficacy. This strategy harnesses the power of AI to generate more engaging, immersive, and tailored learning encounters, thereby tackling the problem of student disengagement. Nonetheless, there exists a conspicuous lack of game-based approaches in AIERs, indicating a promising opportunity for further investigation and advancement [27].

AI has made remarkable progress in Education, especially with the development of Intelligent Tutoring Systems. These systems are known for their adaptability and precision, as they are designed to meet students' unique learning needs and provide personalised and adaptive feedback to each student's performance, allowing for a challenging yet achievable learning experience [26, 29]. The field of Education has been transformed by AI technology, which now offers personalised learning programs tailored to every student's strengths and weaknesses. Thanks to cutting-edge analytics and machine learning techniques, educators are empowered to deliver a truly immersive and bespoke learning experience [29].

3 Methodology

This project will employ the Design Science Research (DSR) methodology, which prioritises creating innovative and pragmatic solutions. DSR is ideally suited for identifying critical challenges that span various application domains. Its focus is on the prompt and effective development of solutions that directly address current needs, thereby advancing the field of study [30]. DSR is vital in bridging theoretical knowledge with practical applications, resulting in tangible enhancements in the examined context. According to [30], the Design Science Research methodology consists of six stages, as illustrated in Fig. 1.

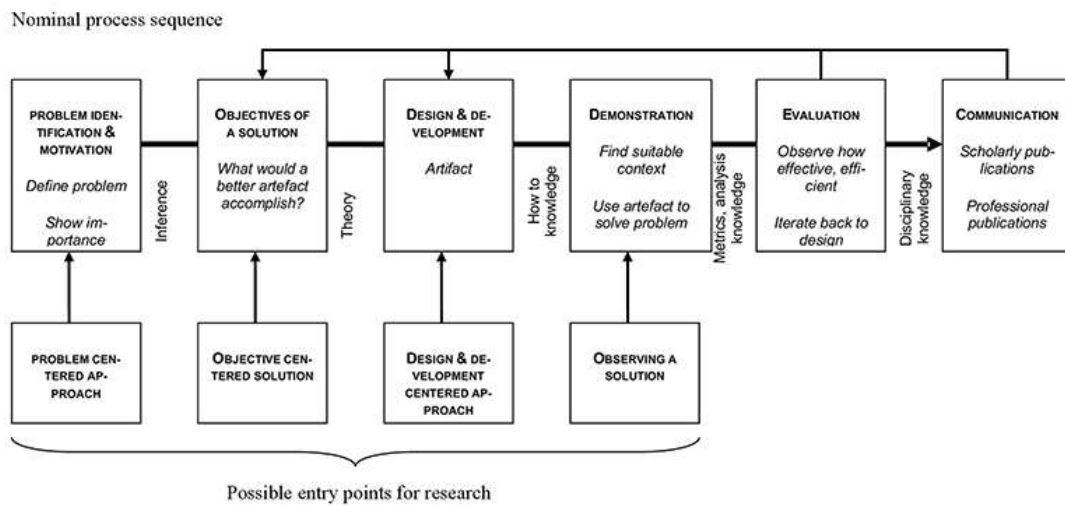


Fig. 1. Design Science Research Model (Adapted from [31])

Table 1 comprehensively maps this study's activities to the various stages of the DSR Methodology. The initial stage, "Problem Identification," is followed by "Objective Definition," which targets enhancing student engagement strategies. The subsequent "Design and Development" phase establishes the project's foundation. "Demonstration" is the next step, testing the artefact's functionality, while "Evaluation" assesses its efficacy. Finally, "Communication" disseminates the findings of the project.

Table 1. Integration of DSR stages in project execution, adapted from [31], with author-specific enhancements regarding the description of each phase.

DSR Stage	Description
Problem Identification	To identify the main reasons for student absenteeism and reduced interest in HE, it is necessary to conduct a detailed investigation. This includes a comprehensive review of relevant literature, surveys, and potentially initial interviews with students and educators to collect qualitative and quantitative information on the causes of lack of attendance.
Objective Definition	It is essential to set clear goals to improve student engagement in HE. These objectives should focus on developing strategies that enhance student engagement. This involves thoroughly investigating the role of Gamification and AI in increasing attendance rates. Objectives should be measurable and address the identified problems, with a particular emphasis on how Gamification and AI can be integrated into educational methodologies.
Design and Development	Development of a prototype by synthesising insights from a systematic literature review. Convene a panel of Gamification, AI, and HE experts to discuss initial findings

	and gather feedback. Utilise this expert input and data from the literature to iterate and refine the design, resulting in a second, more polished version of the artefact.
Demonstration	Practical implementation of the artefact in a HE setting to showcase its functionality in a real-world scenario. The chosen environment should accurately represent the target audience and the specific needs of the artefact while also being suitable for testing and evaluating its functionality. It's also essential to establish a timeline for the implementation phase, including a detailed plan outlining specific tasks and milestones that need to be achieved. This plan should consider any potential challenges or roadblocks during the implementation process.
Evaluation	A comprehensive evaluation of the artefact using qualitative and quantitative methods, including interviews, surveys, and questionnaires. Data collected should be analysed to assess the artefact's effectiveness in addressing the identified problem. Evaluation should also include a feedback loop in the design phase to make necessary improvements based on the findings.
Communication	Writing scientific articles to disseminate research results and contribute to the academic and educational community.

4 Discussion and Conclusion

Integrating Gamification and AI in Education holds immense potential to transform the learning experience. These technologies can significantly enhance student motivation and engagement by incorporating gaming elements into academic curricula and leveraging AI for personalised learning experiences. However, adopting these technologies poses several challenges, including infrastructure requirements, educator training, data privacy concerns, and potential biases. Higher education institutions, facing declining attendance and student interest, can benefit from the unique blend of Gamification principles and AI advancements. This approach aims to create an immersive educational environment, enhancing classroom attendance and engagement.

This position paper is predicated on several crucial assumptions that underpin its framework and findings. To begin with, the viability of the suggested AI and gamification approach hinges upon sufficient technological infrastructure within educational institutions. It presupposes that there are ample digital resources and connectivity to seamlessly incorporate AI systems and gamified learning platforms into current educational models. Additionally, the efficacy of these measures is contingent upon a certain degree of digital literacy among both students and educators. Proficiency in effectively navigating and utilising AI-driven tools and gamified content is essential to realising desired educational outcomes.

However, the study acknowledges limitations, including potential biases in AI algorithms and the scalability of Gamification strategies. Moreover, the lack of long-term empirical studies on these technologies underscores the need for further research to understand their long-term implications in Education.

One area of focus is the advancement of more sophisticated AI algorithms that can be tailored to cater to distinct learning styles and needs. By leveraging AI's adaptive learning capabilities, personalised educational experiences can be developed to enhance engagement and academic outcomes for a more diverse range of students. Another potential research area is exploring the impact and applicability of Gamification strategies across various academic disciplines. While this study primarily addresses general engagement in HE, future research could delve into the specifics of Gamification in different subjects such as science, humanities, and arts. Examining the integration of gamified elements into different subject areas will provide deeper insights into the versatility and adaptability of Gamification in Education. Longitudinal studies represent a crucial research direction for the future. The long-term effects of AI and Gamification on student engagement, retention, and academic performance are still relatively unexplored. Future studies should track these outcomes over extended periods to evaluate the sustainability and long-term benefits of

AI and Gamification integration in learning. This will provide valuable data on the lasting effects of these technological interventions in educational settings.

Collaborating with other educational institutions can provide diverse perspectives and broader data sets for more comprehensive research. Such partnerships can also enable cross-cultural studies, comparing the effectiveness of these strategies in different educational systems and cultural contexts. Ultimately, this study contributes to the current understanding of AI and Gamification in HE and opens up several avenues for future research. By continuously exploring, innovating, and collaborating, we can fully realise the potential of these technologies in enhancing educational experiences. Our study highlights this unique intersection, which has yet to be thoroughly explored, and lays the foundation for future empirical research. Future studies must delve deeper into these identified areas and investigate the practical implications and long-term impacts of these innovative educational approaches.

In summary, this position paper has underscored the transformative potential of integrating AI and Gamification into HE, a paradigm shift to elevate student engagement and motivation. The paper illuminates the path forward for these innovative educational strategies while recognising the inherent challenges, such as infrastructural demands, necessary educator training, data privacy, and the mitigation of algorithmic biases. It emphasises the need for robust technological infrastructure, digital literacy, and an ongoing commitment to address and refine AI and gamification methodologies. The proposed future research avenues, from the customisation of AI algorithms to suit diverse learning styles to the longitudinal studies assessing the long-term impact of these integrations, are not just academic pursuits but vital steps towards an education system that is more engaging, adaptive, and inclusive. Therefore, this position paper not only presents a compelling case for adopting these technologies but also charts a course for their thoughtful and effective implementation, ensuring that the educational landscape remains responsive to the needs and aspirations of the digital age.

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