

ENHANCING ENGAGEMENT IN LEARNING MANAGEMENT SYSTEMS USING GAMIFICATION FRAMEWORK

Maizan Mat Amin, Syadiah Nor Wan Shamsuddin, Wan Mohd Amir Fazamin
Wan Hamzah

Faculty of Informatics and Computing, Universiti Sultan Zainal Abidin
Besut Campus, 22200, Besut, Terengganu, Malaysia

ABSTRACT

The rapidly evolving landscape of higher education demands innovative approaches to engage learners effectively within Learning Management Systems (LMS). This article presents a conceptual framework of gamification explicitly designed for higher education to enhance learner engagement within LMS platforms. Drawing inspiration from game design elements, principles, and motivational theory support, the framework strategically integrates points, badges, and leaderboards to create an interactive and motivating learning environment. The primary objective is to leverage intrinsic motivation, fostering active participation and a deeper understanding of course material. By implementing this framework, higher education institutions can enhance the educational experience for learners, improve retention rates, and cultivate a passion for lifelong learning. This article discusses the gamification framework's theoretical foundation, practical implementation, and potential benefits. It provides insights for educators and administrators seeking to transform their LMS into engaging and effective learning environments in higher education.

KEYWORDS

Gamification, Game design elements, Engagement, Learning Management System, learning environment

1. INTRODUCTION

In recent years, Learning Management Systems (LMS) have become an integral part of higher education, providing a centralized platform for online learning delivery, management, and assessment. However, despite their widespread use, a persistent challenge remains: fostering meaningful learner engagement within these systems [1][2][3]. Traditional learning management systems also frequently lack the dynamic content and interactivity needed to attract and sustain students' interest [4]. Some issues with successfully implementing gamification in an LMS include creating engaging gamified activities, aligning gamification with learning objectives, and evaluating its effects on learner engagement and learning outcomes.

Another major issue with many LMS platforms is the lack of personalization [5][6], offering individualized learning experiences that correspond with each student's needs and preferences. Since learners frequently have different backgrounds and learning preferences, an online education program designed for one-size-fits-all participants may not be able to engage them fully. Furthermore, timely feedback and relevant assessment can be troublesome in online courses, which might lower student motivation and engagement [7] [8]. A holistic approach integrating technological integration, innovative pedagogy, and motivational techniques is needed

to overcome these obstacles and establish a motivating and engaging online learning environment. Research has shown that learner engagement is closely linked to positive learning outcomes, including improved retention, motivation, and academic performance [1].

The research problem addressed in this paper is the difficulty of enhancing learner engagement in LMS, particularly in online education, where engagement is crucial for successful learning. Given the limitations of conventional LMS platforms, innovative strategies are required to sustain learners' interest, motivation, and interaction with the course content. One promising approach is the integration of gamification into LMS. Gamification applies game-like elements, such as points, badges, and leaderboards, to non-game contexts, offering a potentially effective solution to increase student motivation and participation [4][9]. However, there is still a gap in understanding which components or factors of gamification best support learner engagement in an LMS.

The primary objective of this research is to determine the key components of learner engagement within LMS, focusing on how gamification elements can be effectively integrated to enhance engagement. This study aims to provide a framework to guide gamification implementation in LMS by identifying the factors contributing to engagement. This framework will help educators and institutions create more interactive and motivating learning environments, ultimately improving student outcomes and overall satisfaction with online learning. The research also explores how elements such as autonomy, competence, and relatedness—core components of Self-Determination Theory (SDT)—can be grasped through gamification to enhance engagement in online education.

The structure of the article is as follows. Section one introduced the related research topic and knowledge gaps. Next, the theoretical aspects are presented to explore the existing theories and frameworks for engaging learners in learning management systems. The third section describes the proposed framework and the description of each of the framework's elements to engage learners in the learning management system. In the fourth section, the design process and implementation are presented. The research closes with the conclusions and suggestions for future research.

2. RELATED WORK

2.1. Gamification

Gamification is a concept that is gaining popularity and entails incorporating game aspects and ideas into educational settings. Gamification is applying game design features in non-gaming contexts [10]. It expands on the research done by Kapp [11], who thoroughly examines the mechanics of games and their potential to improve learning outcomes. Gamification can revolutionize education by adding interactivity, enjoyment, and motivation. Learner interest and engagement are significantly increased through gamification, which improves the educational experience [12]. This is accomplished by incorporating aspects of games into the teaching process, which turns learning into a fun and engaging activity. Combining incentives like points, badges, and leaderboards into the learning process offers instant feedback and acknowledgment, crucial in encouraging learners to stay involved with the content. Gamification provides a more individualized and efficient learning experience by accommodating various learning paces and styles. This method promotes learner competitiveness in a healthy way, which fosters teamwork and a greater comprehension of the subject matter. Gamification bridges the gap between theory and practice by enabling learners to apply theoretical knowledge in real-world contexts. Additionally, gamification makes learning environments friendlier and less scary by easing the

tension and anxiety frequently connected to conventional teaching techniques. This creative method promotes lifetime learning and adaptability in a constantly changing digital environment while breaking up the monotony of traditional learning and keeping up with modern technological trends.

Intrinsic and extrinsic gamification are the two main ways gamification appears in learning and other situations. To engage people, each type uses various motivating triggers and incentives. Intrinsic gamification encourages intrinsically gratifying activities by emphasizing internal motivations and satisfaction. It promotes mastery by fostering skill development and autonomy, enabling people to make decisions, create objectives, and make choices. As with educational games or hobbies, these activities are made to be enjoyable even in the absence of rewards from outside sources. It satisfies the needs for relatedness, competence, and autonomy in line with Self-Determination Theory (SDT).

On the other hand, extrinsic gamification depends on outside motivations and rewards like points, badges, and incentives; it frequently includes task completion and competition. Relatedness and competence can align with SDT; however, intrinsic motivation might be compromised. Extrinsic and intrinsic gamification play different roles in motivation, and both require skillful tactics to strike a balance between incentives from outside sources and personal fulfillment.

2.2. Gamification Framework

Gamification has gained popularity inside Learning Management Systems (LMS), revolutionizing how people learn in digital contexts. Long-term learner engagement, however, can be challenging to maintain [13]. While gamification features like leaderboards and awards might inspire learners, some may find them unpleasant and stressful [14]. Educators and instructional designers must carefully plan and design gamification features, taking audience demands, ethical considerations, and accessibility requirements into account to solve these difficulties and provide effective learning experiences [4] [14][15][16]. Encouraging a welcoming and inclusive learning atmosphere is still critical to minimizing possible adverse effects and guaranteeing that gamification is helpful in today's educational environments.

Various gamification frameworks have been used, such as the Sustainable Gamification Design (SGD) [17], MDA (Mechanic, Dynamic, Aesthetic) [18][19], and MDE (Mechanic, Dynamic, Emotion) [20]. This study uses the MDE framework to create its proposed framework. The MDE framework, first developed as an adaptation of the MDA framework [18], expands on aesthetics to include player interaction with a game. Acknowledging the applicability of the term "emotion" in characterizing engagement outcomes in some computer games [9], the framework converts aesthetics into emotion, better integrating it with the emotional reactions anticipated in a gamified setting.

In the MDE framework, the mechanics of the gamified situation encompass goals, rules, settings, context, types of interactions, and boundaries. Rule mechanics, setup mechanics, and progression mechanisms constitute three distinct categories within this realm. Rule mechanics dictate permissible actions and their constraints, shaping the sought-after gamified experience. Setup mechanics, which include settings and object distribution, mold the environment of the experience, determining the players' interactions, opponents, and group dynamics. Progression mechanics encompass the diverse instruments designers employ to modify the unfolding experience. The dynamic aspect refers to the behaviors players exhibit as they engage in the gamified experience, and these resulting dynamics are challenging to predict. Dynamics include progression, achievement, competition, exploration, feedback, and time pressure. Emotions

represent the mental and affective states experienced by individual players during their participation, emerging from their adherence to mechanics and the resulting dynamics [6].

2.3. Self-Determination Theory (SDT)

Self-determination theory (SDT) is frequently used as a psychology theory in gamification research [22][8]. It helps researchers identify the factors that enhance individuals' intrinsic motivation and autonomy in gamified learning. By understanding the psychological needs of competence, autonomy, and relatedness, educational game designers can create experiences that meet these needs and promote optimal learning outcomes. Additionally, self-determination theory can guide the development of feedback systems that provide personalized and meaningful information, fostering a sense of competence and mastery in learners. Overall, incorporating self-determination theory into gamification research can lead to the design of more effective and engaging educational games.

Self-determination theory (SDT) is essential for improving motivation in online learning by attending to learners' core psychological requirements for relatedness, competence, and autonomy. Educators can achieve a more interesting and fulfilling learning experience by incorporating SDT into the design of e-learning platforms. This will improve learners' sense of control (autonomy), effectiveness (competence), and connection with others (relatedness). Improved engagement and learning results can result from this emphasis on intrinsic motivation, which involves engaging in activities because they are enjoyable in and of themselves. Thus, implementing SDT principles like giving options, establishing realistic goals, encouraging teamwork, and giving feedback can significantly increase the efficacy of online learning environments.

Gamification and Self-Determination Theory (SDT) complement each other effectively, as gamified elements can address the psychological needs of learners for autonomy, competence, and relatedness. Through gamification, learners can exercise autonomy by selecting challenges or customizing their learning paths, allowing for greater control over their experience. Competence is fostered through points, badges, and leaderboards, which provide visible indicators of progress and success, boosting learners' confidence in their abilities. Lastly, relatedness is enhanced through collaborative activities and social features like leaderboards, peer interaction, and community building. By integrating these gamified elements aligned with SDT, educators can create engaging learning environments that fulfill learners' basic psychological needs, increasing intrinsic motivation and better learning outcomes.

2.4. Gamification Player Types

The Hexad player types framework, developed by Andrzej Marczewski [23], extends Richard Bartle's original player type model by incorporating the psychological needs identified in Self-Determination Theory (SDT): autonomy, competence, and relatedness. Each Hexad type aligns with these needs in different ways. Philanthropists and Socialisers address the need for relatedness, with philanthropists motivated by helping others and socializers driven by social interaction. Free Spirits and Disruptors are aligned with autonomy, as Free Spirits seek freedom and creativity, while Disruptors enjoy challenging systems. Achievers meet the need for competence by striving for mastery and overcoming challenges. At the same time, Players are motivated by external rewards, which can also satisfy the need for competence through visible achievements. By meeting these needs through gamification, the Hexad framework fosters a more engaging user experience and motivates diverse player types, enhancing participation and performance in learning environments.

2.5. Gamification Design

Kevin Werbach's 6D Framework [24] offers a comprehensive method for designing effective gamified systems, particularly suited for environments like Learning Management Systems (LMS). The framework is famous for its structured yet adaptable approach to incorporating game elements into non-gaming contexts. The first step is clearly defining learning goals and setting measurable objectives. The next phase involves identifying target behaviors learners should adopt to meet these goals. Understanding the learners by creating player personas based on their motivations and challenges is crucial for designing engaging gamified experiences. The framework also emphasizes the importance of activity loops, divided into engagement loops (providing continuous motivation) and progression loops (introducing increasingly challenging tasks to maintain interest), as shown in Figure 3. A key aspect of gamification is making the process fun, ensuring tasks are challenging yet enjoyable. Finally, selecting the right tools and platforms is essential for deploying the gamified system effectively. Werbach's 6D Framework ensures that gamification is aligned with learning objectives, engages the intended audience, and encourages the desired behaviors. created the 6D Framework of gamification design, which offers a thorough method for

3. METHODOLOGY

In developing the conceptual framework for enhancing engagement in Learning Management Systems (LMS) using gamification, the research followed the seven-stage process outlined by Ravitch and Riggan [26]. This process integrates the conceptual framework throughout the research stages, emphasizing the literature review to define, justify, and guide the study. The research problem was identified in the first stage, based on the widespread issue of low student engagement in traditional LMS platforms and the gaps in existing literature regarding gamification's potential in educational contexts.

The second stage involved conducting a comprehensive literature review on gamification and its impact on student engagement and motivation. This review provided a foundation for refining the research focus and formulating specific research questions in the third stage. These questions aimed to explore how gamified elements could enhance learner engagement in LMS environments and evolve as new insights were gained throughout the study.

In the fourth stage, a mixed-method research approach was selected to capture quantitative and qualitative data on the effectiveness of gamification strategies. The fifth stage involved designing a gamification framework informed by established game-based learning theories and student motivation. This framework was then integrated into the LMS, ensuring that it addressed the specific engagement issues identified in the research while being aligned with educational best practices.

4. PROPOSED CONCEPTUAL FRAMEWORK

The proposed Gamified Learning Management System (GLMS) framework aims to guide educators and higher educational institutions that want to improve learner engagement by integrating self-determination theory and the gamification method into learning management systems, as presented in Figure 1.

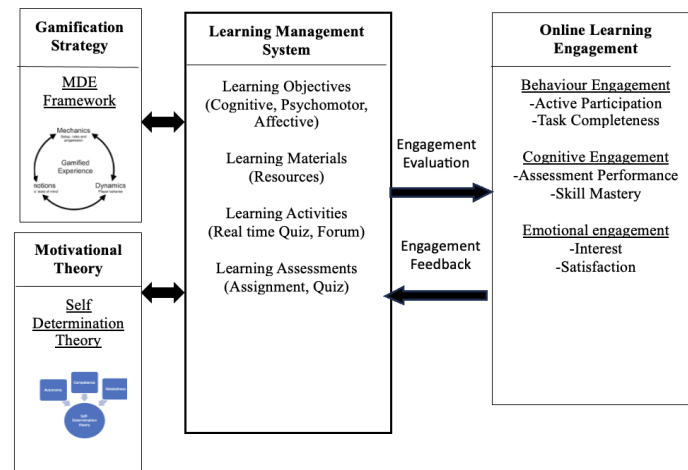


Figure 1. Proposed conceptual framework GLMS.

The following is a description of the components in the conceptual framework:

- Teaching and Learning Strategy using Gamification.** Gamification-based teaching and learning techniques use game-like components and mechanics to produce exciting and inspiring learning environments. The gamified LMS will incorporate both the Hexad and MDE gamification frameworks. Gamification elements, including points, badges, leaderboards, challenges, and rewards, are included in the learning process using the 6D gamification design. According to the Self-Determination Theory, these techniques draw on learners' innate drive by giving them a sense of competence, relatedness, and autonomy [25]. Deeper engagement and knowledge retention are fostered by gamified learning settings, which promote competitiveness, problem-solving, and active participation [4]. Furthermore, gamification is a flexible method that can be adjusted to match specific learning goals, making it an excellent choice for improving instruction in various educational settings [10].
- Motivational Theory Support:** To improve learner motivation and engagement, motivational theory support applies psychological theories like Self-Determination Theory (SDT). These theories guide how learners might establish meaningful learning objectives, become genuinely motivated, and grow in autonomy, competence, and relatedness. Learner engagement can be significantly impacted by educational practices that align with motivational theories, which in turn can create a more positive and productive learning environment [25].
- Learning Environment – Learning Management System (LMS):** Support for Learning Management Systems (LMS) refers to the technology infrastructure and resources that educational institutions offer to enable online learning. LMS platforms provide a central location for communication, evaluation, content delivery, and learner tracking. They are essential in putting teaching and learning concepts into practice in an online setting. To improve learner engagement, the learning management system (LMS) support helps with the organization and delivery of instructional content. It presents chances to add gamification components and assist with motivational theory [26].
- Online Learning Engagement:** The level of interest, participation, and cognitive engagement demonstrated by learners in an online learning environment is called online learning engagement. It includes cognitive engagement (deep thinking and problem-solving), emotional engagement (interest and fulfillment), and behavioral engagement (active

participation) [27]. Learning outcomes are closely correlated with learner engagement, a crucial component that affects how well teaching and learning tactics work.

- **Engagement Evaluation:** The engagement evaluation is the process and instruments used to gauge and quantify learner involvement in online learning. It entails gathering and examining information about learners' behaviors, activities, feelings, and mental processes. Participation rates, the amount of time spent on the course materials, and interactions with the discussion boards and tests are all included in these evaluations. Furthermore, adding gamification components like leaderboards, badges, and points enables real-time feedback on learners' accomplishments and progress, which boosts motivation. A successful assessment strategy should consider various engagement factors and offer educators and institutions helpful information they can use to enhance the educational process. Learner engagement can be fully understood by combining engagement evaluation, LMS capabilities, and motivational theory support [24].
- **Engagement Feedback:** LMS platforms have feedback systems that give learners instant feedback on their work and let educators modify lessons to fit each learner's needs. Furthermore, feedback loops can be used to improve instructional techniques and course materials, guaranteeing continuous improvement in the learning process. A dynamic and adaptable learning environment that encourages active involvement, intrinsic motivation, and the best possible learning results are made possible by engagement evaluation and feedback features in learning management systems (LMS).

These conceptual elements are interrelated in the context of online education, Teaching and learning strategies inform the instructional design, while LMS support provides the technological framework for implementation. Motivational theory supports and enhances learner motivation within this framework, leading to higher levels of online learning engagement. The engagement evaluation and feedback help educators and institutions assess the effectiveness of their strategies and make informed decisions for continuous improvement.

5. THE DESIGN PROCESS AND IMPLEMENTATION

The systematic design process of Implementing the GLMS Framework involves several essential steps, referring to Werbach and Hunter's Six Steps Gamification [24]. It provides a structured approach to designing gamified systems by delineating key stages. While the principles can be adapted for various purposes, the framework's origin and structure make it particularly relevant and beneficial in businesses. This study will adapt the steps for learning purposes to enhance learners' engagement, learner performance, and learner interaction through gamification strategies.

The six steps provide a structured approach to gamification, ensuring alignment between learning objectives, user behaviors, motivations, and system design. The first step, defining the learning objective, involves identifying and prioritizing the key goals that the gamified system should achieve, ensuring they contribute measurable value. Next, the target behavior must be delineated, focusing on learners' actions to achieve these objectives. These behaviors should be quantifiable to measure their effectiveness in driving engagement. In understanding users, the player description step helps identify learners' traits, motivations, and possible demotivators. This step often incorporates frameworks like the Hexad model to create a nuanced understanding of user types interacting with the gamified system.

The following steps ensure that the system is engaging and effective. Designing the activity cycle involves balancing long-term progression and short-term engagement loops that motivate learners. Emphasizing the fun element ensures learners enjoy the process, making participation

voluntary and inherently satisfying. Lastly, deploying the appropriate tools involves selecting the right components and mechanisms that enhance engagement and ensure the system's success. While gamification isn't always necessary, thoughtful implementation within an online learning system can significantly improve learner engagement and overall effectiveness.

Effective implementation of the GLMS conceptual framework, which integrates gamification with Self-Determination Theory (SDT), requires careful planning to boost learner engagement. The framework guides educators and institutions to incorporate gamified elements that foster competence, relatedness, and autonomy in e-learning environments. Several key considerations must be addressed during the design process: first, alignment with objectives is essential to ensure that gamified elements support the intended learning outcomes and do not detract from the educational experience. Second, clear rules and feedback should be established, offering learners timely and constructive feedback to track their progress and areas for improvement. Third, progressive challenges must match the learner's growing competence, creating a sense of achievement and skill mastery. Finally, incorporating collaborative elements such as team-based tasks or competitions can enhance the sense of relatedness and community among learners, improving overall engagement.

Developers can implement strategies to foster learners' relatedness, competence, and autonomy. Autonomy support allows learners to make choices about their learning journey, such as selecting goals and paths and giving them options for interacting with the content and assessments. Competence building can be achieved through scaffolded learning experiences, offering progressive challenges, prompt feedback, and opportunities for skill enhancement. To promote relatedness, developers can organize online events, peer collaborations, and discussion forums to create a sense of community within the LMS, encouraging networking and peer support. Additionally, instructor involvement is crucial, as educators can actively facilitate discussions, providing support that enhances both the relatedness and competence of learners.

6. CONCLUSION

In conclusion, enhancing online learner engagement is an ongoing process, and integrating gamification with Self-Determination Theory (SDT) in Learning Management Systems (LMS) has shown significant potential. By combining gamified features with the principles of autonomy, competence, and relatedness, educators and institutions can transform online learning experiences. A multimodal evaluation approach, incorporating behavioral, emotional, and cognitive aspects, provides a holistic view of engagement. These strategies improve the effectiveness of online learning and lead to better learning outcomes, retention, and course completion rates. While SDT emphasizes intrinsic motivation and psychological needs, gamification drives active engagement, creating a synergistic effect. Adopting these methods allows higher education institutions to build inclusive, motivating, and engaging virtual environments that help learners achieve their objectives and elevate the quality of education.

7. FUTURE WORK

For future research, personalization, long-term impact, and engagement metrics are key areas to explore in gamified learning environments. First, future studies should focus on personalizing gamified experiences to cater to individual learning preferences. Adaptive technologies can tailor challenges, rewards, and learning paths based on a learner's behavior and progress, creating more meaningful and sustained engagement. Secondly, longitudinal studies are essential for assessing the long-term effects of gamification on learner engagement and learning outcomes. While short-term motivation may increase, researchers must evaluate whether gamified elements

sustain learner interest and improve academic performance. Third, researchers should also explore the application of gamification across different disciplines and educational settings to examine its broader applicability and effectiveness. Finally, there is a need to measure emotional and cognitive engagement holistically in gamified environments. Most studies focus on behavioral data (e.g., participation rates), but integrating qualitative methods to assess learners' emotional and cognitive engagement would provide a complete understanding of how gamification impacts learning. Future work can better inform the design of effective gamified learning systems by addressing these areas.

ACKNOWLEDGEMENTS

This research received no specific grant from public, commercial, or not-for-profit funding agencies. It was supported by the Centre for Research Excellence and Incubation Management (CREIM) at Universiti Sultan Zainal Abidin (UniSZA), specifically under the Faculty of Informatics and Computing (FIK). We are deeply grateful for their assistance—special thanks to UNISZA and FIK for their invaluable support in conducting this research.

REFERENCES

- [1] F. Martin and D. U. Bolliger, "Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment," *Online Learn. J.*, vol. 22, no. 1, pp. 205–222, 2018, doi: 10.24059/olj.v22i1.1092.
- [2] J. Gillett-Swan, "The Challenges of Online Learning: Supporting and Engaging the Isolated Learner," *J. Learn. Des.*, vol. 10, no. 1, p. 20, 2017, doi: 10.5204/jld.v9i3.293.
- [3] L. Cifuentes, "A Guide to Administering Distance Learning," *A Guid. to Adm. Distance Learn.*, 2021, doi: 10.1163/9789004471382.
- [4] G. Kiryakova, "Engaging Learning Content for Digital Learners," *TEM J.*, vol. 11, no. 4, pp. 1958–1964, 2022, doi: 10.18421/TEM114-65.
- [5] H. A. Alamri, S. Watson, and W. Watson, "Learning Technology Models that Support Personalization within Blended Learning Environments in Higher Education," *TechTrends*, vol. 65, no. 1, pp. 62–78, 2021, doi: 10.1007/s11528-020-00530-3.
- [6] P. Veluvali and J. Suriseti, "Learning Management System for Greater Learner Engagement in Higher Education—A Review," *High. Educ. Futur.*, vol. 9, no. 1, pp. 107–121, 2022, doi: 10.1177/234763112111049855.
- [7] S. Narciss, "Designing and evaluating tutoring feedback strategies for digital learning environments on the basis of the interactive tutoring feedback model," *Digit. Educ. Rev.*, vol. 23, no. 1, pp. 7–26, 2013.
- [8] Z. Zainuddin, S. K. W. Chu, M. Shujahat, and C. J. Perera, "The impact of gamification on learning and instruction: A systematic review of empirical evidence," *Educ. Res. Rev.*, 2020, doi: 10.1016/j.edurev.2020.100326.
- [9] H. Cigdem, M. Ozturk, Y. Karabacak, N. Atik, S. Gürkan, and M. H. Aldemir, "Unlocking student engagement and achievement: The impact of leaderboard gamification in online formative assessment for engineering education," *Educ. Inf. Technol.*, 2024, doi: 10.1007/s10639-024-12845-2.
- [10] S. Deterding, M. Sicart, L. Nacke, K. O'Hara, and D. Dixon, "Gamification. using game-design elements in non-gaming contexts," *Proc. 2011 Annu. Conf. Ext. Abstr. Hum. factors Comput. Syst. - CHI EA '11*, p. 2425, 2011, doi: 10.1145/1979742.1979575.
- [11] K. M. Kapp, *The gamification of learning and instruction: game-based methods and strategies for training and education*. John Wiley & Sons., 2012.
- [12] A. Khaldi, R. Bouzidi, and F. Nader, "Gamification of e-learning in higher education: a systematic literature review," *Smart Learn. Environ.*, vol. 10, no. 1, 2023, doi: 10.1186/s40561-023-00227-z.
- [13] J. Hamari, J. Koivisto, and H. Sarsa, "Does gamification work?—a literature review of empirical studies on gamification," *Proc. Annu. Hawaii Int. Conf. Syst. Sci.*, vol. January, no. 6–9, pp. 3025–3034, 2014.

- [14] R. N. Landers and M. B. Armstrong, "Enhancing instructional outcomes with gamification: An empirical test of the Technology-Enhanced Training Effectiveness Model," *Comput. Human Behav.*, vol. 71, pp. 499–507, 2017, doi: 10.1016/j.chb.2015.07.031.
- [15] O. Goethe and A. Palmquist, "Broader Understanding of Gamification by Addressing Ethics and Diversity," *Lect. Notes Comput. Sci. (including Subser. Lect. Notes Artif. Intell. Lect. Notes Bioinformatics)*, vol. 12425 LNCS, pp. 688–699, 2020, doi: 10.1007/978-3-030-60128-7_50.
- [16] S. Schöbel *et al.*, "A research agenda for the why, what, and how of gamification designs: Outcomes of an ecis 2019 panel," *Commun. Assoc. Inf. Syst.*, vol. 46, pp. 706–721, 2020, doi: 10.17705/1CAIS.04630.
- [17] M. Raftopoulos, "Towards gamification transparency: A conceptual framework for the development of responsible gamified enterprise systems.," *J. Gaming Virtual Worlds*, vol. 6, no. 2, pp. 159–178, 2014.
- [18] R. Hunicke, M. Leblanc, and R. Zubek, "MDA: A formal approach to game design and game research," *AAAI Work. - Tech. Rep.*, vol. WS-04-04, pp. 1–5, 2004.
- [19] U. Ruhi, "Level Up Your Strategy: Towards a Descriptive Framework for Meaningful Enterprise Gamification," *Technol. Innov. Manag. Rev.*, vol. 5, no. 8, pp. 5–16, 2015, doi: 10.22215/timreview/918.
- [20] K. Robson, K. Plangger, J. H. Kietzmann, I. McCarthy, and L. Pitt, "Is it all a game? Understanding the principles of gamification," *Bus. Horiz.*, vol. 58, no. 4, pp. 411–420, 2015, doi: 10.1016/j.bushor.2015.03.006.
- [21] I. Blohm and J. M. Leimeister, "Gamification: Design of IT-based enhancing services for motivational support and behavioral change," *Bus. Inf. Syst. Eng.*, vol. 5, no. 4, pp. 275–278, 2013, doi: 10.1007/s12599-013-0273-5.
- [22] K. Seaborn and D. I. Fels, "Gamification in theory and action: A survey," *Int. J. Hum. Comput. Stud.*, vol. 74, pp. 14–31, 2015, doi: 10.1016/j.ijhcs.2014.09.006.
- [23] A. Marczewski, "EVEN NINJA MONKEYS LIKE TO PLAY How to Use Narrative to Create Deeper Experiences," 2015, [Online]. Available: <https://www.gamified.uk/wp-content/uploads/2018/10/Narrative-Chapter.pdf>
- [24] D. Werbach, K., & Hunter, *For the win, revised and updated edition: The power of gamification and game thinking in business, education, government, and social impact*. University of Pennsylvania Press., 2020.
- [25] V. M. Bradley, "Learning Management System (LMS) Use with Online Instruction," *Int. J. Technol. Educ.*, vol. 4, no. 1, p. 68, 2020, doi: 10.46328/ijte.36.
- [26] P. Redmond, L. A. Abawi, A. Brown, R. Henderson, and A. Heffernan, "An online engagement framework for higher education," *Online Learn. J.*, vol. 22, no. 1, pp. 183–204, 2018, doi: 10.24059/olj.v22i1.1175.
- [27] S. P. Adams and R. Du Preez, "Supporting Student Engagement Through the Gamification of Learning Activities: A Design-Based Research Approach," *Technol. Knowl. Learn.*, vol. 27, no. 1, pp. 119–138, 2022, doi: 10.1007/s10758-021-09500-x.

AUTHORS

Maizan Mat Amin obtained her Master of Science (Computer Science) majoring in Multimedia from Universiti Putra Malaysia, Bachelor of Information Technology (Information Science) from Universiti Kebangsaan Malaysia (UKM), and Diploma of Information Technology from Kolej Agama Sultan Zainal Abidin (currently known as Universiti Sultan Zainal Abidin (UniSZA)). She joined Universiti Sultan Zainal Abidin (UniSZA), Terengganu, Malaysia since 1999 and is now a Senior Lecturer at the School of Multimedia, Faculty of Informatics and Computing, UniSZA. She has authored or co-authored more than 45 journals and articles with 6 H-index (Google Scholar) and more than 117 citations. Her research areas are Multimedia, Human-Computer Interaction, Visual Informatics, Virtual and Augmented Reality, Gamification, and e-learning.



Prof. Madya Dr Syadiah Nor Wan Shamsuddin is an Associate Professor at the Faculty of Informatics and Computing, Universiti Sultan Zainal Abidin (UniSZA), Malaysia. Her research areas include Virtual Reality, e-learning, and Multimedia.



Dr. Wan Mohd Amir Fazamin Wan Hamzah is a Senior Lecturer at the Faculty of Informatics and Computing, Universiti Sultan Zainal Abidin (UniSZA), Malaysia.

He received PhD from Universiti Malaysia Terengganu, Malaysia. His research areas include learning analytics, e-learning, gamification, and machine learning.

