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International
Journal on
e-Learning
and
Higher
Education

International Journal on e-Learning and Higher Education 21 (3) 2026, 9-18

GAMIFY Framework: A Gamification Approach to Student Motivation and Engagement in Self-Directed Online Learning

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ARTICLE INFO

Article history:

Received 24 September 2025

Revised 31 March 2026

Accepted 22 June 2026

Online first

Published 30 September 2026

Keywords:

Gamification

GAMIFY Framework

Online Learning

Self-Determination Theory

Self-Directed Learning

DOI:

10.24191/ijelhe.v21n3.2132

ABSTRACT

Motivation and engagement are critical in self-directed online learning. Many learners find it difficult to stay persistent when they must manage their own pace, goals, and participation with limited external support. This paper introduces the GAMIFY Framework (Gamification for Motivation, Interaction, and Flexibility in Learning). This is a structured model that applies gamification to strengthen motivation and sustain engagement. The framework follows five steps. The first step is to identify objectives and present them as meaningful quests that connect learning goals to personal growth. The second step is to understand the learner's context and reward actions such as reading, asking questions, and contributing knowledge, so that everyday efforts are recognised. The third step is selecting game elements that support the three needs in Self-Determination Theory: autonomy, competence, and relatedness. Autonomy is encouraged through learner choice and customisation; competence is strengthened through badges, levels, and XP; and relatedness is supported through leaderboards, likes, and group challenges. The fourth step assigns experience points (XP) to replace traditional grading, which provides immediate feedback and a clear sense of progress. The final step defines rules and introduces a reward marketplace where learners can redeem XP for incentives such as deadline extensions, bonus marks, or access to additional resources. By turning routine learning activities into opportunities for recognition and progress, the GAMIFY Framework promotes motivation and persistence while supporting collaboration in online learning environments. It shows how gamification can move beyond entertainment to become a purposeful design strategy that connects intrinsic motivation with self-directed learning. This study offers practical guidance for improving online course design and has implications for both higher education and lifelong learning.

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1. INTRODUCTION

Online learning has expanded rapidly over the past decade, offering learners greater flexibility, accessibility, and personalisation. However, one of the most persistent challenges in digital education is sustaining student motivation and engagement, particularly in self-directed online learning (SDOL) environments where learners must regulate their own pace, set goals, and maintain persistence without continuous instructor presence. When learners are unable to sustain motivation, they are more likely to disengage, resulting in lower participation rates, incomplete courses, and superficial learning outcomes (James et al., 2025). These issues require innovative learning design strategies that can maintain attention, reinforce persistence, and foster intrinsic motivation throughout the learning process.

In recent years, gamification has emerged as an effective strategy for increasing motivation in online learning environments. Gamification involves applying game mechanics such as points, badges, levels, leaderboards, and feedback loops into non-game settings to stimulate participation and enjoyment (Amin et al., 2024; Zhao, 2024). When well-designed, gamification promotes learners' sense of achievement and provides clear, immediate feedback. However, much of the early application of gamification in education focused primarily on extrinsic rewards, such as badges or leaderboards, without adequately addressing intrinsic motivation (Jaskari & Syrjälä, 2024). Consequently, many gamified systems succeeded in generating short-term excitement but failed to sustain long-term engagement or self-regulated learning behaviours (Zhang et al., 2025).

To address this gap, the GAMIFY Framework (Gamification for Motivation, Interaction, and Flexibility in Learning) is introduced as a conceptual model that integrates gamification with Self-Determination Theory (SDT). The framework emphasises designing gamified learning environments that meet the three psychological needs central to SDT: autonomy (a sense of control and choice), competence (a feeling of mastery and effectiveness), and relatedness (a sense of social belonging). By integrating these intrinsic drivers into gamified learning design, the framework aims to enhance both motivation and engagement in self-directed online learning contexts.

This conceptual paper introduces the five-step GAMIFY Framework and outlines how each stage contributes to enhancing student motivation and sustaining engagement throughout the online learning process. It builds upon prior research on online knowledge sharing and intrinsic motivation design (Ramakrishnan, 2019). It extends these principles into a comprehensive gamification framework suitable for higher education and lifelong learning environments.

The paper also contributes to the growing discourse on integrating motivational psychology with learning design. Rather than treating gamification as a set of decorative game features, it positions gamification as a pedagogical approach for shaping learner experience that actively supports autonomy, self-regulation, and mastery. The GAMIFY Framework is thus proposed not merely as a tool for entertainment but as a systematic design strategy to sustain learner motivation, enhance engagement, and promote persistence in self-directed online learning.

2. LITERATURE REVIEW

2.1 Gamification in Online Learning

Gamification has become a well-established approach in educational research and practice, especially in digital and online learning environments. It involves applying game design elements such as points, badges, levels, leaderboards, and feedback loops to non-game contexts to stimulate engagement and motivation (Ukgoda, 2025). The aim is not to turn learning into a game, but to enhance learners' emotional and cognitive engagement by embedding elements that evoke curiosity, competition, and a sense of achievement (Chiu et al., 2024; Huseinović, 2024; Tu & Lee, 2025).

In the context of higher education, gamification has been associated with increased learner participation, improved persistence, and better satisfaction in online and blended courses (Lampropoulos & Sidiropoulos, 2024; Nguyen-Viet & Doan Ngoc Minh, 2025; Vosiqova & Khadjibayeva, 2024). However, many early implementations of gamification relied heavily on extrinsic motivators, rewarding learners for completing activities rather than encouraging self-driven learning. This often resulted in short-term engagement that faded when rewards were removed, highlighting a critical gap between participation and sustained motivation.

To address this limitation, recent studies have shifted their focus toward motivational gamification, in which the design emphasises meaningful learning experiences rather than surface-level rewards. This approach draws from motivational psychology, particularly Self-Determination Theory (SDT), which provides a framework for understanding how learning environments can support intrinsic motivation through autonomy, competence, and relatedness.

2.2 Self-Determination Theory (SDT) and Motivation in Learning

Self-Determination Theory (SDT) provides a valuable lens for understanding student motivation in both traditional and online learning environments. SDT suggests that individuals are naturally inclined to grow and learn when three basic psychological needs are fulfilled: autonomy, competence, and relatedness (Ryan & Deci, 2020). Autonomy refers to the sense of volition and control over one's learning activities; competence is the feeling of mastery and capability in completing challenges; and relatedness is the sense of belonging and connection with others in the learning environment.

When these needs are satisfied, learners experience intrinsic motivation, characterised by interest, curiosity, and enjoyment in learning for its own sake (Vansteenkiste et al., 2010). When these needs are not met, for example, when learning feels too controlled, or there is little feedback, students start to lose interest. They then focus more on earning rewards, grades, or praise from others rather than enjoying the learning itself.

Integrating SDT into gamification design helps bridge the gap between temporary engagement and sustained motivation. Studies have shown that gamified elements such as choice-based pathways (autonomy), progress indicators (competence), and peer collaboration tools (relatedness) can reinforce learners' internal drive to continue learning (Krath et al., 2021; Sailer et al., 2017). These findings provide a strong theoretical foundation for the GAMIFY Framework, which uses SDT as a guiding principle for designing intrinsically motivating online learning experiences.

2.3 Gamification Models and Frameworks

Over the past decade, many models and frameworks have been proposed to guide the design of gamified learning experiences. The early gamification model (Kapp, 2019) and the 6D framework (Werbach & Hunter, 2023) provided instructional designers with guidelines for integrating game mechanics into learning. This model and framework were valuable because they introduced educators to the practical side of gamification. Designers were encouraged to identify learning goals, describe learner profiles, and select game elements that could make learning experiences more interactive. However, many of these early frameworks focused primarily on the visible aspects of games, such as points, badges, and leaderboards. They often failed to address the psychological processes that sustain intrinsic motivation and long-term engagement.

To address these shortcomings, subsequent research introduced frameworks that incorporate motivational and emotional dimensions. The Mechanics–Dynamics–Aesthetics (MDA) Framework (Hunicke et al., 2004), originally developed for game design, was later adapted for education to help designers understand how game mechanics are used in learning (Gao & Pan, 2023). Similarly, the Octalysis Framework identifies eight motivational factors, such as achievement, ownership, meaning, and social connection, that influence human engagement (Chou, 2019). The Octalysis model was notable for distinguishing between intrinsic and extrinsic motivation, marking a conceptual shift from simply using points and badges to designing experiences that connect to learners' internal desires for mastery and purpose.

Despite these contributions, many of the models and frameworks were still rooted in game design rather than in learning theory. They helped create engaging interfaces, but were less effective for guiding educational environments that depend on self-direction and reflective learning. A previous study noted that early gamified systems displayed what they called a mechanical bias (Seaborn & Fels, 2015). In other words, they were good at encouraging participation but less successful at nurturing internal motivation or critical reflection.

Recent studies have introduced more holistic frameworks that combine gamification design with motivational theory. A model was proposed that merges Self-Determination Theory with Cognitive Load Theory (Baah et al., 2024). Their research suggests that gamification can enhance intrinsic motivation when cognitive demands are managed effectively. Another study developed the RECIPE model, which promotes meaningful gamification by emphasising Reflection, Exposition, Choice, Information, Play, and Engagement (Nicholson, 2014). These elements support emotional involvement and encourage sustained engagement rather than temporary interest.

A more recent study introduced the Gamification Classification Framework (Vrcelj Božić et al., 2025). This model categorises game elements by their motivational effects and examines which elements are most effective across different learning contexts. It highlights that no single element works for all learners. The usefulness of each feature depends on how it aligns with learner needs and the balance between challenge and competence.

Models and frameworks from previous studies reveal a clear shift in the field of gamified education. Researchers have moved from describing what game features to use toward understanding how and why these features motivate learners. This development marks a transition from mechanical gamification to motivational gamification that is grounded in psychological theory. Nevertheless, few models offer a clear structure for designing gamified environments that support self-directed learning. The proposed GAMIFY Framework aims to fill this gap by placing motivation at the centre of its design. It offers a systematic five-step process that links game elements to the psychological needs of autonomy, competence, and relatedness.

Through this integration, the GAMIFY Framework builds on earlier research but moves beyond it by providing a practical pathway for educators. It guides the creation of online learning spaces that foster self-direction and long-term engagement. The framework also contributes to a deeper understanding of how gamification can transform learning from a series of isolated activities into a sustained and motivating experience.

3. METHODOLOGY

3.1 Conceptual Approach

This paper presents a conceptual study that develops the GAMIFY Framework, which combines gamification and motivational theory to improve student engagement in self-directed online learning. The research does not rely on empirical data but instead builds its arguments through the synthesis of existing literature. The main purpose is to connect what is already known about gamification, motivation, and self-directed learning into a single framework that educators can apply or test in future studies.

The process of framework development is guided by design-based reasoning. This approach begins with identifying a real educational problem and then uses theory and design thinking to propose a solution. The central problem addressed in this study is the difficulty students face in staying motivated when they learn independently in online settings. By using design reasoning, theory and practice are linked together to form a structure that is both conceptually sound and practical for instructional design.

3.2 Theoretical Foundations

The GAMIFY Framework is grounded in Self-Determination Theory (SDT), developed by Deci and Ryan (1985). SDT explains how motivation works by focusing on three basic psychological needs: autonomy, competence, and relatedness. When these needs are fulfilled, learners are more likely to feel motivated and engaged. In this framework, autonomy is supported when learners have the freedom to choose their learning path. Competence is encouraged through challenges that provide feedback and a sense of progress. Relatedness is achieved through opportunities for collaboration and interaction among peers.

The framework also draws from the principles of gamified learning design and self-directed learning (SDL). Gamified learning uses game elements to create interest and participation, while SDL highlights learner control and responsibility. By combining both, the GAMIFY Framework treats gamification not as entertainment but as a meaningful structure that supports persistence, ownership, and satisfaction in learning.

3.3 Framework Development Process

The development of the framework involved three stages: identifying the problem, constructing the theoretical model, and validating it conceptually.

(i) Stage 1: Identifying the Problem and Reviewing Literature

A broad review of studies on gamification and online learning revealed that many gamified systems increased participation only in the short term. However, few managed to maintain learner motivation over time. This observation highlighted the need for a new framework that focuses on the deeper aspects of motivation rather than on temporary engagement.

(ii) Stage 2: Constructing the Model

Concepts from Self-Determination Theory were then mapped onto the typical behaviours of self-directed learners. This process helped identify how game elements such as badges, levels, and feedback can support autonomy, competence, and relatedness. The mapping led to the formulation of five clear steps: identifying learning objectives, understanding learner actions, selecting appropriate game elements, assigning experience points, and defining rules and rewards.

(iii) Stage 3: Conceptual Validation

The draft version of the framework was compared with several existing gamification models, including MDA, Octalysis, and RECIPE. This comparison allowed refinement of the framework so that it aligns with current motivational theories and addresses weaknesses found in earlier models. The outcome is a practical, theoretically grounded structure that can later be tested across different learning environments.

3.4 Overview of the Framework

The GAMIFY Framework presents a five-step process to strengthen motivation and engagement in self-directed online learning.

- (i) Identify Objectives: Transform learning goals into purposeful quests that connect to personal growth and progress.
- (ii) Understand Learner Context and Actions: Recognise how learners engage in online spaces and reward meaningful actions such as reading, questioning, and contributing knowledge.
- (iii) Select Game Elements: Use elements that nurture autonomy, competence, and relatedness. Autonomy can be supported by choice and flexibility, competence through badges and levels, and relatedness through collaboration and recognition.
- (iv) Assign Experience Points (XP): Replace traditional grading with XP to provide immediate feedback and a sense of advancement.
- (v) Define Rules and Reward Marketplace: Establish transparent rules and allow learners to use XP for incentives such as deadline extensions, bonus marks, or access to additional materials.

This process provides a balanced approach that combines structure and flexibility. It encourages learners to stay active in their learning journey while providing educators with a practical guide to creating meaningful gamified environments.

4. RESULTS AND DISCUSSION

The GAMIFY Framework presents a structured way to integrate gamification into self-directed online learning while addressing the underlying psychological factors that sustain motivation and engagement. It connects the practical design of game elements with the motivational principles of Self-Determination Theory (SDT), making it relevant for learners who manage their own pace and goals. The framework does not focus merely on participation or competition but on creating meaningful learning experiences that encourage persistence and self-regulation.

Each stage of the framework responds to a specific challenge that learners commonly face in online learning. The first stage focuses on identifying objectives that transform learning outcomes into purposeful missions. When learners see their goals as achievable quests that relate to personal growth, they tend to develop a stronger sense of autonomy. They become more aware of why they are learning, not just what they are expected to complete. This sense of direction helps maintain commitment even when external supervision is minimal.

The next stage involves understanding learner actions and designing systems that recognise meaningful engagement. In many online courses, small but consistent actions such as reading, posting, and contributing go unnoticed. The framework suggests acknowledging these behaviours with points or progress indicators to reinforce the value of active participation. When learners realise that their efforts are noticed, their sense of competence improves, and they feel encouraged to continue contributing.

Selecting suitable game elements is another crucial part of the framework. Game features such as badges, levels, and peer interaction tools are not meant to be decorative or competitive. Instead, they act as mechanisms for feedback and social connection. Badges represent milestones of achievement, levels show growth and progress, and leaderboards can promote collaboration rather than rivalry. These elements collectively address the three needs highlighted by SDT: autonomy, competence, and relatedness. Learners feel in control of their progress, receive recognition for their abilities, and experience a sense of belonging within the learning community.

Assigning experience points (XP) creates a feedback system that maintains engagement throughout the learning process. Unlike traditional grades, which are delayed until the end of an assessment, XP provides immediate feedback on learner actions. This constant feedback loop helps learners track their progress and adjust their strategies when needed. The visibility of progress sustains interest and supports the self-monitoring behaviour essential for self-directed learning.

The final stage of the framework involves establishing clear rules and introducing a reward marketplace. This system allows learners to exchange accumulated XP for tangible incentives such as deadline extensions, bonus marks, or additional learning resources. These rewards serve as reinforcement for consistent effort rather than as a competition for top positions. The marketplace also supports decision-making and self-regulation because learners must plan how to use their rewards strategically.

The GAMIFY Framework thus creates an environment that balances freedom and structure. It acknowledges that motivation in self-directed learning comes not only from internal curiosity but also from recognition and progression. By meeting the psychological needs of autonomy, competence, and relatedness, the framework transforms gamification from a surface-level engagement tool into a deeper learning strategy. It also addresses common challenges in online learning, such as isolation, lack of feedback, and uneven participation.

The framework aligns well with findings from previous research that highlight the importance of meaningful feedback, social presence, and learner autonomy. Studies by Christopoulos (2023) and Baah et al. (2024) suggest that gamified systems grounded in SDT promote sustained motivation and reduce cognitive fatigue. Similarly, earlier work by Ramakrishnan (2019) on online knowledge sharing found that intrinsic motivation, visual feedback, and social connection significantly improved learner participation. The GAMIFY Framework builds upon these insights and organises them into a design process that educators can apply systematically.

Overall, the discussion indicates that gamification can be more than a motivational accessory. When guided by theory and careful design, it becomes a pedagogical tool that enhances learner ownership and engagement. The GAMIFY Framework provides a foundation for future empirical studies and invites educators to rethink how digital learning environments can motivate learners from within rather than through external rewards.

5. CONCLUSIONS AND RECOMMENDATIONS

This paper introduced the GAMIFY Framework, a conceptual model designed to strengthen student motivation and engagement in self-directed online learning. The framework was developed through a synthesis of gamification principles and motivational theory, particularly Self-Determination Theory (SDT). It proposes five interconnected steps: (1) identifying objectives, (2) understanding learner actions, (3) selecting suitable game elements, (4) assigning experience points, and (5) defining rules with a reward marketplace. Together, these steps provide educators with a structured approach to create learning environments that nurture autonomy, competence, and relatedness.

The key contribution of this framework lies in its focus on meaningful motivation rather than surface-level engagement. It moves beyond the traditional use of points and badges as simple rewards, treating them instead as tools that provide feedback, track progress, and promote personal growth. The framework also encourages reflection and decision-making, which are essential for sustaining motivation in self-directed learning. By linking game design elements with psychological needs, the GAMIFY Framework offers a bridge between technology design and educational theory.

The discussion has shown that the framework addresses several persistent challenges in online learning. It provides immediate feedback that reduces learner isolation, promotes continuous participation through visible progress, and creates opportunities for social interaction. It also offers flexibility through the reward marketplace, allowing learners to make choices that reflect their individual goals and needs. These features make the framework suitable for use in a range of educational settings, including higher education, professional development, and lifelong learning programs.

For educators and instructional designers, the framework offers a practical guide to integrating gamification into course design. It can be implemented in existing learning management systems without significant restructuring. The emphasis on autonomy and feedback makes it compatible with both synchronous and asynchronous learning modes. Institutions can also use the framework as a foundation for developing analytics tools that track learner motivation and progress, helping instructors provide timely support.

Future research should focus on empirically testing and refining the GAMIFY Framework. Quantitative studies can measure their effect on motivation, engagement, and academic performance. Qualitative research can explore how learners experience the framework and which design features are most effective for sustaining interest. Comparative studies could also examine how the framework performs across disciplines and cultural contexts. These investigations would help validate the framework and identify areas for improvement.

In conclusion, the GAMIFY Framework provides a timely response to the evolving needs of online learners. It recognises that motivation and engagement are not by-products of technology but outcomes of thoughtful design. By embedding psychological understanding into gamification, the framework creates opportunities for learning that are both enjoyable and meaningful. It also reinforces the idea that the most effective online learning experiences are those that give learners ownership of their progress while supporting their need to connect, achieve, and grow.

6. ACKNOWLEDGEMENTS

The authors gratefully acknowledge the support and contributions of all individuals and organisations involved in this study.

7. FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

8. AUTHORS' CONTRIBUTIONS

Prasanna Ramakrisnan: Conceptualisation, methodology, formal analysis, validation, investigation and writing-original draft; Syamsul Ariffin Yahaya: Conceptualisation, formal analysis, writing- review and editing and validation.

9. CONFLICT OF INTEREST DECLARATION

We certify that the article is the Authors' and Co-Authors' original work. The article has not received prior publication and is not under consideration for publication elsewhere. This manuscript has not been submitted for publication, nor has it been published in whole or in part elsewhere. We attest that all Authors have contributed significantly to the work, the validity and legitimacy of the data, and its interpretation for submission to IJELHE.

10. DECLARATION OF GENERATIVE AI IN THE WRITING PROCESS

During the preparation of this work, the authors used GEMINI minimally, primarily to assist in summarising lengthy statements and improving language clarity. After using this tool, the authors reviewed and edited the content as needed and took full responsibility for the publication's content.

11. DATA AVAILABILITY/SUPPLEMENTARY MATERIALS

Data sharing does not apply to this article as no new datasets were generated or analysed during the current study.

12. REFERENCES

Amin, M. M., Shamsuddin, S. N. W., & Hamzah, W. (2024). Enhancing Engagement in Learning Management Systems using Gamification Framework. *The International Journal of Multimedia & Its Applications*, 16(5), 21–31. <https://doi.org/10.5121/ijma.2024.16502>

Baah, C., Govender, I., & Subramaniam, P. R. (2024). Enhancing learning engagement: A study on gamification's influence on motivation and cognitive load. *Education Sciences*, 14(10), 1115. <https://doi.org/10.3390/educsci14101115>

Chiu, P. C., Rupitan, M. J., Kuok, K. K., Sharbini, H., Borhan, N. H., & Yeo, A. (2024). The Effects of Gamification in Space Exploration Learning. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, 265–274. <https://doi.org/10.37934/araset.58.4.110>

Chou, Y. (2019). *Actionable Gamification: Beyond Points, Badges, and Leaderboards*.

Deci, E. L., & Ryan, R. M. (1985). Intrinsic Motivation and Self-Determination in Human Behaviour. *In Intrinsic Motivation and Self-Determination in Human Behaviour*. <https://doi.org/10.1007/978-1-4899-2271-7>

Gao, Y., & Pan, L. (2023). Learning English vocabulary through playing games: the gamification design of vocabulary learning applications and learner evaluations. *Language Learning Journal*, 51(4). <https://doi.org/10.1080/09571736.2023.2217828>

Hunicke, R., Leblanc, M., & Zubek, R. (2004). *MDA: A formal approach to game design and game research*. AAAI Workshop - Technical Report, WS-04-04.

Huseinović, L. (2024). The effects of gamification on student motivation and achievement in learning English as a foreign language in higher education. *MAP Education and Humanities*, 4, 10–36. <https://doi.org/10.53880/2744-2373.2023.4.10>

James, W., Oates, G., & Schonfeldt, N. (2025). Improving retention while enhancing student engagement and learning outcomes using gamified mobile technology. *Accounting Education*, 34(3), 366–386. <https://doi.org/10.1080/09639284.2024.2326009>

Jaskari, M.-M., & Syrjälä, H. (2024). One solution does not fit all: Reward-based and meaningful gamification in higher education. In *Practices and Implementation of Gamification in Higher Education* (pp. 22–49). IGI Global Scientific Publishing. <https://doi.org/10.4018/979-8-3693-0716-8.ch002>

Kapp, K. M. (2012). *The gamification of learning and instruction: game-based methods and strategies for training and education*. John Wiley & Sons.

Krath, J., Schürmann, L., & von Korfflesch, H. F. O. (2021). Revealing the theoretical basis of gamification: A systematic review and analysis of theory in research on gamification, serious games and game-based learning. *Computers in Human Behaviour*, 125. <https://doi.org/10.1016/j.chb.2021.106963>

Lampropoulos, G., & Sidiropoulos, A. (2024). Impact of gamification on students' learning outcomes and academic performance: A longitudinal study comparing online, traditional, and gamified learning. *Education Sciences*, 14(4), 367. <https://doi.org/10.3390/educsci14040367>

Nguyen-Viet, B., & Doan Ngoc Minh, H. (2025). How Gamification Enhances Learning Effectiveness Through Blended Learning and Intrinsic Motivation: The Moderating Effects of Self-Regulation. *Sage Open*, 15(4), 21582440251385850. <https://doi.org/10.1177/21582440251385846>

Nicholson, S. (2014). A recipe for meaningful gamification. In *Gamification in education and business* (pp. 1–20). Springer. https://doi.org/10.1007/978-3-319-10208-5_1

Ramakrisnan, P. (2019). Gamifying Online Knowledge Sharing Environment: A Motivating User Interface Design. *International Visual Informatics Conference*, 123–134. https://doi.org/10.1007/978-3-030-34032-2_12

Sailer, M., Hense, J. U., Mayr, S. K., & Mandl, H. (2017). How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction. *Computers in Human Behaviour*, 69, 371–380. <https://doi.org/10.1016/j.chb.2016.12.033>

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

Tu, H.-Y., & Lee, S. W.-Y. (2025). Curiosity, interest, and engagement: unpacking their roles in students' learning within a virtual game environment. *Journal of Educational Computing Research*, 62(8), 1775–1799. <https://doi.org/10.1177/07356331241277904>

Ukgoda, H. (2025). Gamification in Education: Its Impact on Engagement, Motivation, and Learning Outcomes. *Journal of Educational Technology Development and Exchange (JETDE)*, 18(3), 41–66. <https://doi.org/10.18785/jetde.1803.03>

Vansteenkiste, M., Niemiec, C. P., & Soenens, B. (2010). The development of the five mini-theories of self-determination theory: An historical overview, emerging trends, and future directions. *Advances in Motivation and Achievement*, 16 PARTA. [https://doi.org/10.1108/S0749-7423\(2010\)000016A007](https://doi.org/10.1108/S0749-7423(2010)000016A007)

Vosiqova, M. S., & Khadjibayeva, S. F. (2024). Leveraging Gamification in Blended Learning: Enhancing Engagement and Learning Outcomes Through Game-Based Strategies. *IMRAS*, 7(12), 7–14. <https://doi.org/10.5281/zenodo.14278716>

Vrcelj Božić, A., Hoić-Božić, N., Holenko Dlab, M., Stančin, K., & Jaguš, T. (2025). Gamification Classification as a Framework for Analysing Gamification Elements in Digital Educational Tools. *Journal of Communications Software and Systems*, 21(1), 34–42. <https://doi.org/10.24138/jcomss-2024-0111>

Werbach, K., & Hunter, D. (2023). Level 5 Game Changer: Six Steps to Gamification. In *For the Win, Revised and Updated Edition*. <https://doi.org/10.9783/9781613631041-006>

Zhang, X., Teng, H., Zhu, L., & Qiu, B. (2025). Short-term exposure to aggressive card games: Releasing emotion without escalating post-game aggression. *Frontiers in Psychology*, 16, 1505360. <https://doi.org/10.3389/fpsyg.2025.1505360>

Zhao, F. (2024). Gamification Design. In *User Experience Methods and Tools in Human-Computer Interaction* (pp. 373–441). CRC Press.



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