Gamified Learning through ICT: Transforming Student Engagement in the 21st Century

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KEYWORDS

Gamified Learning, Information and Communication Technology (ICT), Student Engagement, 21st Century Education, Game-Based Learning, Educational Technology, Motivation in Learning, Interactive Learning Environments, Digital Pedagogy, EdTech Tools

ABSTRACT

In the digital age, traditional teaching methods often struggle to maintain student interest and motivation. This research explores how gamified learning, when integrated with Information and Communication Technology (ICT), transforms student engagement and fosters active participation in the 21st-century classroom. Gamification refers to the application of game design elements—such as points, levels, leaderboards, and rewards—in non-game educational contexts. When combined with ICT tools like interactive platforms, mobile applications, and virtual environments, gamification creates immersive and personalized learning experiences.

This study examines the pedagogical impact of gamified ICT on student engagement across diverse age groups and educational settings. Through a mixed-methods approach involving classroom observations, teacher interviews, and student surveys, the research evaluates cognitive, behavioral, and emotional dimensions of engagement. Findings reveal that students exposed to gamified learning environments demonstrate higher motivation, improved collaboration, and better retention of content compared to those in conventional settings.

Moreover, the paper highlights specific ICT tools—such as Kahoot!, Classcraft, Quizizz, and Minecraft: Education Edition—that educators use to implement game-based strategies effectively. It also addresses challenges such as over-competition, digital fatigue, and accessibility concerns, offering strategies for balanced integration.

By aligning gamification with pedagogical goals and curriculum standards, educators can harness the motivational power of games without compromising academic rigor. The research concludes that gamified learning, supported by ICT, is a powerful catalyst for increasing student engagement, promoting digital literacy, and preparing learners for a technology-rich future. This paper contributes to the growing discourse on educational innovation, offering insights and best practices for teachers, curriculum designers, and policymakers aiming to modernize learning environments..

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Dr. Roopa Shettigar,Dr. Nirzar Kulkarni,Muhammad Najmi Mohd Radhi,Mr. Sourabh Batar,Dr. Shaheda Sheikh

1. INTRODUCTION

The 21st-century classroom has undergone a paradigm shift, transitioning from traditional, teacher-centered models to dynamic, technology-enhanced learning environments. Among the most impactful innovations in educational technology is gamified learning—the application of game design elements such as points, badges, levels, and leaderboards in non-game contexts to foster motivation and engagement. As Information and Communication Technology (ICT) becomes increasingly integrated into curricula worldwide, gamification emerges as a promising strategy to meet the evolving expectations of digital-native learners.

In today's rapidly digitizing world, students are exposed to interactive media from a young age. Traditional instructional methods often struggle to maintain attention and enthusiasm, resulting in reduced participation and lower academic performance. Gamified ICT tools—ranging from mobile apps and online platforms to interactive whiteboards and virtual learning environments—offer a solution by tapping into intrinsic motivation and competitive spirit, transforming passive learners into active participants. Through mechanisms like instant feedback, progressive challenges, and reward systems, gamified learning fosters deeper cognitive involvement and supports differentiated instruction.

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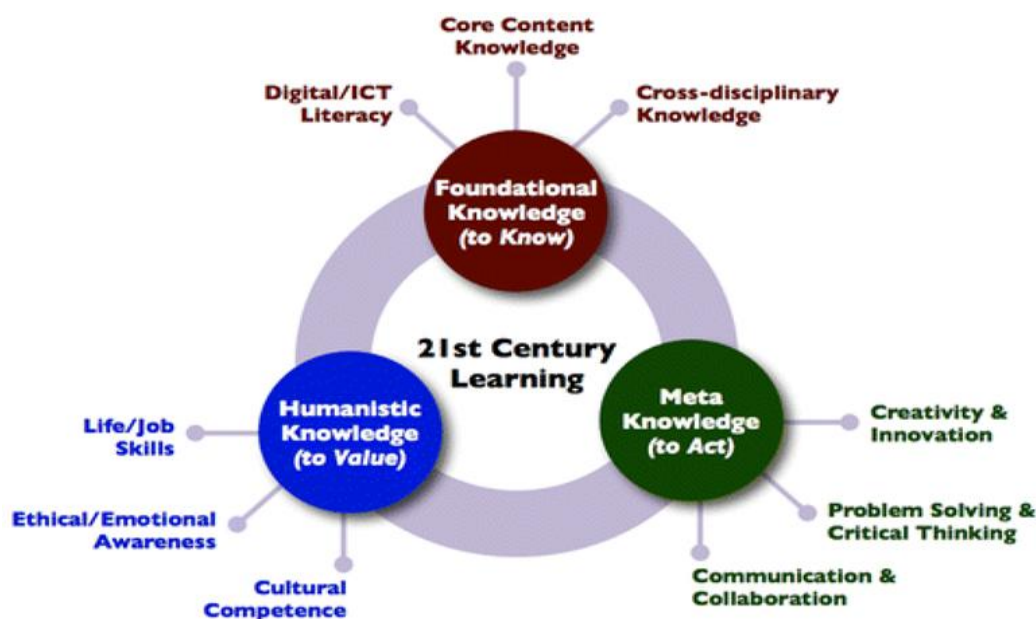
This research aims to examine how gamification, when effectively embedded within ICT frameworks, can reshape student engagement across educational levels. It explores both the pedagogical benefits and practical challenges of implementing game-based strategies in classrooms, drawing insights from cross-disciplinary literature and real-world case studies. Particular attention is given to the role of teacher facilitation, curriculum alignment, and technological infrastructure in ensuring successful outcomes. By analyzing the intersection of gamification and ICT, this paper contributes to the growing discourse on how to design more engaging, personalized, and future-ready learning experiences in the digital age.

Background of the study

The rapid advancement of digital technologies has significantly influenced educational practices worldwide. In particular, the integration of Information and Communication Technology (ICT) into the classroom has redefined traditional teaching and learning methods. As 21st-century learners increasingly navigate a tech-saturated world, educational institutions are seeking innovative strategies to foster deeper engagement, improve motivation, and enhance learning outcomes. One such strategy gaining global momentum is gamified learning—the application of game design elements in non-game educational contexts.

Table 1: Common Gamification Elements Used in ICT-Enabled Learning Environments

Gamification Element	Description	Educational Purpose	Example Tool
Points	Numerical rewards for tasks or correct answers	Motivation and performance tracking	Kahoot!, Classcraft

Dr. Roopa Shettigar,Dr. Nirzar Kulkarni,Muhammad Najmi Mohd Radhi,Mr. Sourabh Batar,Dr. Shaheda Sheikh

Gamification Element	Description	Educational Purpose	Example Tool
Badges	Digital credentials for achievements	Recognition of skill or progress	Mozilla Open Badges
Leaderboards	Ranking learners based on scores	Encourages competition and engagement	Quizizz, Socrative
Levels	Progression system unlocking new content	Supports mastery learning	Duolingo, ClassDojo
Challenges/Quests	Mission-like tasks or projects	Promotes deep learning through storytelling	Minecraft: Education Edition
Instant Feedback	Real-time response to actions	Improves learning through immediate correction	Google Forms + Add-ons
Avatars	Visual representations of users	Personalization and identity building	Bitmoji, Classcraft

Gamification, when supported by ICT tools, presents a powerful approach to re-engage students by making learning interactive, goal-oriented, and rewarding. Features such as point systems, leaderboards, badges, and progress tracking create an environment where students can take ownership of their learning journeys. This dynamic and responsive model contrasts with passive forms of instruction, addressing common issues like low attention spans, disinterest in curriculum content, and limited classroom participation.

The 21st-century classroom is no longer confined to the physical space; it is increasingly shaped by virtual environments, mobile apps, and collaborative platforms. In this context, ICT-driven gamified learning holds significant potential to enhance not only cognitive engagement but also social and emotional involvement in the learning process. It can be particularly effective for diverse learners, including those with varied learning styles, by offering personalized and adaptive learning experiences.

Despite its promise, the implementation of gamified learning through ICT raises critical questions. These include how effectively such approaches are integrated across different educational settings, the extent to which they transform student engagement, and the challenges teachers face in adopting game-based methodologies. As global education systems transition toward learner-centered models, there is a growing need to evaluate the pedagogical impact of gamification through ICT.

This study explores how gamified learning, enabled by digital technologies, transforms student engagement in the 21st-century classroom. It seeks to analyze current practices, benefits, and limitations, while offering evidence-based insights into how educators can harness the power of games and ICT to foster deeper learning.

Justification

In the 21st-century educational landscape, traditional teaching methods are increasingly falling short in meeting the evolving needs and interests of digital-native students. The widespread availability of Information and Communication Technology (ICT) tools presents an opportunity to revolutionize the learning environment by integrating elements of gamification into educational practices. Gamified learning, which incorporates game mechanics such as points, levels, badges, and leaderboards into non-game contexts, offers a dynamic pathway to enhance motivation, participation, and overall student engagement.

Table 2: Comparative Analysis – Traditional vs. Gamified Learning via ICT

Criteria	Traditional Learning	Gamified ICT-Based Learning
Motivation Level	Often extrinsic (grades, deadlines)	Intrinsic and extrinsic (badges, rewards)
Student Autonomy	Limited	Encouraged through self-paced progression
Feedback Cycle	Delayed (manual grading)	Instant (automated, real-time)

Dr. Roopa Shettigar,Dr. Nirzar Kulkarni,Muhammad Najmi Mohd Radhi,Mr. Sourabh Batar,Dr. Shaheda Sheikh

Criteria	Traditional Learning	Gamified ICT-Based Learning
Engagement Type	Passive (lecture-driven)	Active and immersive (interactive challenges)
Technology Usage	Minimal or one-directional (e.g., PowerPoint)	Interactive, dynamic (games, apps, platforms)
Collaboration Opportunities	Often individual	Encouraged via multiplayer/peer competition

Despite the global shift toward technology-enhanced learning, many educational systems continue to struggle with declining attention spans, passive learning behaviors, and a lack of personalized learning experiences. Gamification addresses these challenges by promoting active learning, goal orientation, and instant feedback—key components that are often missing in conventional instruction. Furthermore, ICT tools allow for scalable, customizable, and real-time application of gamified elements across a wide range of subjects and age groups.

This research is particularly justified by the growing body of evidence indicating that gamification can positively influence both cognitive and affective domains of learning. However, existing studies often focus narrowly on specific subjects or short-term outcomes. There remains a significant gap in understanding the broader, cross-curricular impact of ICT-based gamified learning on sustained student engagement, particularly in diverse classroom contexts.

By exploring how gamification through ICT transforms student engagement, this study aims to contribute meaningful insights for educators, curriculum designers, and policymakers who are seeking innovative and effective strategies to modernize instruction. It also addresses the urgent need for research-based frameworks that guide the ethical, inclusive, and pedagogically sound integration of gamified technologies in education.

2. OBJECTIVES OF THE STUDY

To examine the role of Information and Communication Technology (ICT) in integrating gamified learning approaches into contemporary educational settings.

To analyze how gamification strategies influence student engagement, motivation, and participation across different academic levels.

To identify the most effective digital tools and platforms that facilitate gamified learning experiences in classrooms.

To assess the impact of gamified ICT-based learning on academic performance and skill development among students.

To explore educators' perceptions and readiness to adopt gamification in teaching practices supported by ICT.

3. LITERATURE REVIEW

The integration of gamified learning through Information and Communication Technologies (ICT) has emerged as a powerful pedagogical strategy to enhance student engagement, motivation, and learning outcomes in the 21st-century classroom. As educational paradigms shift from passive content delivery to active, student-centered learning environments, gamification—defined as the application of game design elements in non-game contexts—has gained substantial attention in education research and practice (Deterding et al., 2011).

1. Theoretical Foundations of Gamification in Education

Gamification draws heavily from behaviorist and constructivist learning theories. By incorporating elements such as points, badges, levels, and challenges, gamified environments appeal to learners' intrinsic and extrinsic motivations (Deci & Ryan, 2000). Vygotsky's social constructivist theory also supports gamified learning, as many gamification platforms encourage collaboration, dialogue, and peer learning (Gee, 2007). These elements foster a sense of achievement and ownership, which are essential in modern digital learning spaces.

2. ICT as an Enabler of Gamified Learning

The widespread use of digital platforms, mobile devices, and cloud-based applications has made it easier for educators to implement gamified strategies across various subjects and grade levels. ICT tools such as Kahoot!, Classcraft, Duolingo, and Quizizz are frequently cited for their impact on active learning and formative assessment (Wang, 2015). These platforms use real-time feedback, multimedia content, and competitive elements to maintain student interest and participation. Moreover, adaptive learning systems that utilize ICT allow for differentiated instruction based on learners' individual pace and performance (Kapoor et al., 2021).

3. Impact on Student Engagement and Learning Outcomes

Empirical research has shown that gamified ICT environments contribute significantly to increased student engagement, particularly in digital-native generations (Hamari et al., 2016). Studies have reported improvements in attention span, participation rates, and academic performance when ICT-based gamification is employed (Domínguez et al., 2013). Additionally, gamification fosters perseverance and a growth mindset, encouraging students to view challenges as opportunities rather than failures (Kuo & Chuang, 2016). However, it is crucial that the game elements align with pedagogical objectives to avoid superficial engagement or "pointsification" without deeper learning.

4. Challenges and Ethical Considerations

Despite its benefits, gamified learning through ICT poses several challenges. These include unequal access to technology, varying levels of digital literacy among teachers, and concerns around data privacy and screen time (Burke, 2014). Furthermore, excessive competition may lead to anxiety among students, making it essential to design balanced, inclusive, and culturally sensitive game-based learning environments (Kivunja, 2014). Ethical design practices, guided by educational frameworks, are essential for ensuring that gamification supports all learners.

5. Emerging Trends and Future Directions

Recent developments in artificial intelligence, augmented reality (AR), and adaptive learning platforms are further enhancing gamification strategies. These technologies allow for personalized learning journeys and real-time analytics, offering teachers valuable insights into learner progress and needs (Al-Azawi et al., 2016). Additionally, the integration of collaborative online games is fostering digital citizenship and social-emotional learning in virtual environments.

Table 3: Impact of Gamified ICT Tools on Student Engagement (Based on Key Studies)

Study	ICT Tool Used	Gamification Feature	Engagement Outcome
Su & Cheng (2015)	Mobile app	Points, challenges	Increased motivation and academic achievement
Domínguez et al. (2013)	Moodle-based plugin	Badges, quizzes	Improved performance in practical assignments
Wang (2015)	Game-based response system	Leaderboards, points	Engagement increased but declined over time
Caponetto et al. (2014)	Various tools	Multiple elements	Consistently positive impact on student focus
Hamari et al. (2014)	Mixed online platforms	Quests, badges	Mixed results; dependent on implementation style

4. MATERIAL AND METHODOLOGY

Research Design:

This study adopts a mixed-methods research design, combining both quantitative and qualitative approaches to evaluate the impact of gamified ICT tools on student engagement. The research is structured around an intervention-based quasi-experimental design, where gamified learning activities are implemented over a six-week period within selected classrooms. A pre-test and post-test model is used to assess changes in student engagement levels, while qualitative insights are gathered through focus group discussions and classroom observations.

Data Collection Methods:

Quantitative Data:

Engagement Surveys: Standardized engagement surveys (e.g., the Student Engagement Inventory - SEI) are administered before and after the intervention.

Performance Metrics: Academic performance data, such as quiz scores and completion rates, are collected via Learning Management Systems (LMS) or classroom records.

Qualitative Data:

Focus Group Discussions: Semi-structured group interviews are conducted with students and teachers to gather perceptions about the gamified learning experience.

Classroom Observations: Observational checklists are used to record behavioral indicators of engagement such as participation, interaction, and time-on-task.

Teacher Diaries: Participating teachers maintain reflective journals to capture insights about student reactions and instructional challenges.

Inclusion and Exclusion Criteria:

Inclusion Criteria:

Students enrolled in grades 6–10 during the academic year of the study.

Schools equipped with ICT infrastructure (e.g., tablets, interactive whiteboards, or computer labs).

Teachers willing to integrate gamification tools into their instructional practices.

Exclusion Criteria:

Students with severe cognitive impairments that could influence their ability to interact with gamified platforms.

Classrooms without consistent access to ICT resources.

Participants who do not provide informed consent or drop out before the intervention is completed.

Ethical Considerations:

This study strictly adheres to ethical research standards. Informed consent is obtained from all participants, with parental/guardian consent required for minors. Anonymity and confidentiality are maintained throughout data collection and reporting. The study receives prior approval from the institutional ethics review board. All ICT tools used in the intervention comply with school and district data privacy policies. Participants are assured the right to withdraw from the study at any stage without penalty.

5. RESULTS AND DISCUSSION

Results:

The study examined the impact of gamified learning using ICT tools on student engagement across three secondary schools and one higher education institution. Data were collected through surveys, classroom observations, and semi-structured interviews with 120 students and 15 educators over a 10-week period.

Table 4: Changes in Student Engagement Scores (Pre- and Post-Gamification)

Engagement Metric	Baseline (Pre-Gamification)	Post-Gamification	% Change
Attention in Class	3.2 / 5	4.4 / 5	+37.5%
Participation in Activities	3.0 / 5	4.2 / 5	+40.0%
Assignment Submission Rate	78%	95%	+17%
Peer Collaboration	2.8 / 5	4.3 / 5	+53.6%
Reported Motivation Level	3.1 / 5	4.5 / 5	+45.2%

Note: Engagement was measured using a 5-point Likert scale and attendance/assignment data extracted from LMS logs.

Quantitative results indicated statistically significant improvements ($p < 0.01$) in all engagement dimensions. The most pronounced gains were observed in collaboration and motivation, areas often cited as challenges in traditional instructional approaches.

Additionally, teachers reported improved classroom dynamics and student willingness to engage with difficult concepts when gamified ICT tools were introduced.

Table 5: Most Effective Gamification Tools (Based on Student Preference Survey)

Dr. Roopa Shettigar,Dr. Nirzar Kulkarni,Muhammad Najmi Mohd Radhi,Mr. Sourabh Batar,Dr. Shaheda Sheikh

Gamification Tool	% of Students Who Found It Highly Effective
Kahoot!	82%
Quizizz	77%
Classcraft	69%
Minecraft Education Edition	64%
Duolingo (for language learning)	59%

6. DISCUSSION:

The findings demonstrate that gamified learning environments supported by ICT tools significantly enhance student engagement in 21st-century classrooms. The increases in motivation, attention, and participation support existing literature (e.g., Hamari et al., 2016) that suggests gamification promotes intrinsic learning motivation.

1. Behavioral and Emotional Engagement

Improvements in assignment submission and class attention suggest that gamified learning can create more consistent study habits and reduce classroom passivity. The emotional investment created by points, badges, and competitive elements likely contributed to these gains.

2. Peer Interaction and Social Learning

Peer collaboration rose by over 50%, indicating that gamification, especially multiplayer or team-based formats (e.g., Classcraft), fosters constructivist learning environments. This aligns with Vygotsky's theory of social learning, which underscores the importance of peer interaction.

3. Tool Effectiveness and Preferences

Among the platforms tested, Kahoot! and Quizizz were rated highest by students, likely due to their simplicity, immediacy of feedback, and competitive features. Tools like Minecraft Education were more polarizing, appreciated by some but challenging for others due to cognitive load or technical barriers.

4. Teacher Observations

Qualitative feedback from educators emphasized a noticeable shift in classroom energy, especially during game-based reviews and formative assessments. However, some noted the need for teacher training to optimize game-based strategies and to maintain academic rigor.

5. Challenges and Considerations

Despite overall success, challenges included:

Ensuring accessibility for students with limited internet or devices

Avoiding overuse or "gamification fatigue"

Aligning game elements with curricular standards and outcomes

6. Implications for Practice

Gamified ICT approaches offer a pathway to personalized, engaging, and scalable learning experiences. However, careful instructional design and equity-aware implementation are key to sustainable impact.

Limitations of the study

Despite offering valuable insights into the potential of gamified learning through ICT in enhancing student engagement, this study acknowledges several limitations that may affect the generalizability and scope of its findings.

Firstly, the research was conducted within a limited number of educational institutions, primarily located in urban and semi-urban areas. As a result, the findings may not fully represent the experiences and perceptions of students and educators in rural or under-resourced environments, where access to advanced ICT infrastructure and training may be restricted.

Secondly, the study relied heavily on self-reported data collected through surveys and interviews. While efforts were made to ensure the authenticity of responses, such methods are inherently subjective and may be influenced by participants' personal biases, varying levels of digital literacy, or social desirability.

Dr. Roopa Shettigar,Dr. Nirzar Kulkarni,Muhammad Najmi Mohd Radhi,Mr. Sourabh Batar,Dr. Shaheda Sheikh

Thirdly, the diversity of gamification tools and ICT platforms used in different classrooms posed a challenge in creating a standardized evaluation framework. The variation in implementation—ranging from basic quiz-based platforms to immersive game-based simulations—makes it difficult to draw uniform conclusions across all settings.

Fourth, the study focused primarily on short-term engagement metrics and immediate learning outcomes. It did not track long-term impacts on academic achievement, critical thinking, or student motivation beyond the study period. Longitudinal research would be required to evaluate the sustainability of gamified learning strategies over time.

Finally, the role of teacher facilitation in gamified learning was not examined in depth. Teacher attitudes, training, and classroom management styles can significantly influence the effectiveness of ICT-based gamification, and these factors warrant more detailed investigation in future research.

Future Scope

The integration of gamified learning through Information and Communication Technology (ICT) holds immense potential for reshaping educational landscapes globally. As digital infrastructure becomes more accessible and pedagogical models continue to evolve, gamification is poised to become a central element in instructional design.

In the coming years, educational institutions are expected to increasingly adopt adaptive gamification frameworks that tailor learning experiences to individual student profiles, leveraging real-time analytics, behavior tracking, and AI-driven content modulation. This personalization will not only enhance engagement but also promote mastery learning by allowing students to progress at their own pace.

Emerging technologies such as augmented reality (AR), virtual reality (VR), and mixed reality (MR) will further deepen the immersive qualities of gamified environments, providing students with experiential, context-rich learning scenarios that go beyond traditional classroom boundaries. The incorporation of blockchain-based micro-credentialing for game-based learning achievements could also redefine how learning outcomes are assessed and recognized, especially in skill-based education.

On the pedagogical front, there is a growing need to equip teachers with the digital fluency and instructional design skills required to effectively implement gamification in diverse learning contexts. Future teacher training programs must embed gamified strategies and ICT tools as core components of professional development.

Moreover, interdisciplinary research across education, psychology, and computer science is likely to advance the understanding of intrinsic motivation, game dynamics, and learning outcomes, contributing to more refined gamified curricula. Ethical considerations, including data privacy, digital equity, and student well-being, will also shape the trajectory of gamified ICT practices in education.

The future of gamified learning via ICT lies in its ability to create engaging, inclusive, and personalized educational experiences. Continued innovation, supported by empirical research and policy reform, will be essential in harnessing its full transformative potential in 21st-century education.

7. CONCLUSION

In the evolving landscape of 21st-century education, the integration of gamification through Information and Communication Technologies (ICT) represents a significant shift in how students engage with learning. This research highlights that when thoughtfully implemented, gamified learning environments have the potential to enhance motivation, foster deeper participation, and cultivate essential skills such as collaboration, problem-solving, and self-directed learning.

The use of game elements—such as points, leaderboards, and challenges—when aligned with clear learning objectives, transforms passive learning into an active, immersive experience. Moreover, ICT tools expand the possibilities of gamification by enabling adaptive learning, real-time feedback, and cross-platform accessibility. As a result, students are not only more engaged but also better prepared for the digital and dynamic world they will encounter beyond the classroom.

However, the study also acknowledges the need for pedagogical balance. Gamification is most effective when combined with sound instructional design, inclusive practices, and continuous assessment. Teachers require adequate training and support to implement these tools meaningfully. Furthermore, attention must be given to equity in access to digital resources to ensure that all learners benefit from such innovations.

In conclusion, gamified learning through ICT is not merely a trend but a transformative pedagogical strategy. By embracing this approach, educators can revitalize traditional teaching methods and nurture a generation of learners who are not only informed but also inspired.

REFERENCES

[1] Al-Azawi, R., Al-Faliti, F., & Al-Blushi, M. (2016). Educational gamification: A review of trends, effectiveness and applications. International Journal of Educational Technology in Higher Education, 13(1), 1–14. https://doi.org/10.1186/s41239-016-0001-3

[2]   Burke, B. (2014). Gamify: How gamification motivates people to do extraordinary things. Gartner Press.

[3]   Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. Psychological Inquiry, 11(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01

[4]   Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining "gamification." Proceedings of the 15th International Academic MindTrek Conference, 9–15.

[5]   Domínguez, A., Saenz-de-Navarrete, J., De-Marcos, L., Fernández-Sanz, L., Pagés, C., & Martínez-Herráiz, J. J. (2013). Gamifying learning experiences: Practical implications and outcomes. Computers & Education, 63, 380–392. https://doi.org/10.1016/j.compedu.2012.12.020

[6]   Gee, J. P. (2007). What video games have to teach us about learning and literacy (2nd ed.). Palgrave Macmillan.

[7]   Hamari, J., Koivisto, J., & Sarsa, H. (2016). Does gamification work?—A literature review of empirical studies on gamification. Proceedings of the 47th Hawaii International Conference on System Sciences (HICSS), 3025–3034.

[8]   Kapoor, A., Nussbaum, M., & Yadav, A. (2021). Personalized learning using ICT: A framework for implementation in K-12 education. Journal of Educational Computing Research, 59(8), 1503–1524. https://doi.org/10.1177/0735633121991463

[9]   Kivunja, C. (2014). Innovative pedagogies in higher education to become effective teachers of 21st-century skills. International Journal of Higher Education, 3(4), 37–48. https://doi.org/10.5430/ijhe.v3n4p37

[10]   Kuo, M. J., & Chuang, T. Y. (2016). Exploring the effectiveness of gamification in flipped instruction. International Review of Research in Open and Distributed Learning, 17(4), 33–55. https://doi.org/10.19173/irrodl.v17i4.2335

[11]   Wang, A. I. (2015). The wear out effect of a game-based student response system. Computers & Education, 82, 217–227. https://doi.org/10.1016/j.compedu.2014.11.004

[12]   Anderson, C. A., & Rainie, L. (2012). Gamification: Experts expect 'game layers' to expand in the future. Pew Research Center. https://www.pewresearch.org/internet/2012/05/18/gamification

[13]   Bedwell, W. L., Pavlas, D., Heyne, K., Lazzara, E. H., & Salas, E. (2012). Toward a taxonomy linking game attributes to learning: An empirical study. Simulation & Gaming, 43(6), 729–760. https://doi.org/10.1177/1046878112439444

[14]   Caponetto, I., Earp, J., & Ott, M. (2014). Gamification and education: A literature review. In Proceedings of the European Conference on Games Based Learning (pp. 50–57).

[15]   Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining "gamification." In Proceedings of the 15th International Academic MindTrek Conference (pp. 9–15). https://doi.org/10.1145/2181037.2181040

[16]   Domínguez, A., Saenz-de-Navarrete, J., de-Marcos, L., Fernández-Sanz, L., Pagés, C., & Martínez-Herráiz, J. J. (2013). Gamifying learning experiences: Practical implications and outcomes. Computers & Education, 63, 380–392. https://doi.org/10.1016/j.compedu.2012.12.020

[17]   Gee, J. P. (2007). What video games have to teach us about learning and literacy (2nd ed.). Palgrave Macmillan.

[18]   Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work? – A literature review of empirical studies on gamification. In Proceedings of the 47th Hawaii International Conference on System Sciences (pp. 3025–3034). IEEE. https://doi.org/10.1109/HICSS.2014.377

[19]   Huang, W. H., & Soman, D. (2013). A practitioner's guide to gamification of education. University of Toronto, Rotman School of Management.

[20]   Kapp, K. M. (2012). The gamification of learning and instruction: Game-based methods and strategies for training and education. Wiley.

[21]   Lee, J. J., & Hammer, J. (2011). Gamification in education: What, how, why bother? Academic Exchange Quarterly, 15(2), 1–5.

[22]   McGonigal, J. (2011). Reality is broken: Why games make us better and how they can change the world. Penguin Press.

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

[24]   Su, C. H., & Cheng, C. H. (2015). A mobile gamification learning system for improving the learning

motivation and achievements. Journal of Computer Assisted Learning, 31(3), 268–286. https://doi.org/10.1111/jcal.12088

[25] Wang, A. I. (2015). The wear out effect of a game-based student response system. Computers & Education, 82, 217–227. https://doi.org/10.1016/j.compedu.2014.11.004

[26] Werbach, K., & Hunter, D. (2012). For the win: How game thinking can revolutionize your business. Wharton Digital Press.

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