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Impact of Gamification on Knowledge Acquisition

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Abstract

Purpose: The general objective of the study was to examine the impact of gamification on knowledge acquisition.

Methodology: The study adopted a desktop research methodology. Desk research refers to secondary data or that which can be collected without fieldwork. Desk research is basically involved in collecting data from existing resources hence it is often considered a low cost technique as compared to field research, as the main cost is involved in executive's time, telephone charges and directories. Thus, the study relied on already published studies, reports and statistics. This secondary data was easily accessed through the online journals and library.

Findings: The findings reveal that there exists a contextual and methodological gap relating to gamification on knowledge acquisition. Preliminary empirical review revealed that integrating gamification elements into educational platforms and training programs consistently led to improvements in knowledge acquisition across various contexts. Gamified learning environments effectively motivated learners, fostered engagement, and facilitated collaborative learning experiences. Findings emphasized the importance of aligning gamification strategies with instructional goals, considering learner preferences, and iterating design based on feedback. While the study highlighted the potential of gamification to enhance learning outcomes, further research is needed to explore optimal strategies and long-term effects. Overall, gamification emerged as a promising approach for promoting effective learning and skill development.

Unique Contribution to Theory, Practice and Policy: The Self Determination theory, Cognitive Load theory and Constructivism theory may be used to anchor future studies on gamification of knowledge acquisition. The study provided several recommendations based on its findings. Firstly, it suggested integrating gamification elements into educational programs to enhance engagement and learning outcomes. Secondly, it recommended leveraging gamification for promoting active learning and problem-solving skills among learners. Thirdly, it advised organizations to invest in gamified training programs to improve knowledge acquisition and job performance among employees. Lastly, the study emphasized the importance of ongoing research to better understand the effectiveness of gamification in education and training contexts.

Keywords: *Gamification, Knowledge Acquisition, Learning Outcomes, Educational Programs, Active Learning, Problem-solving Skills, Training Programs, Research Evaluation*

1.0 INTRODUCTION

Knowledge acquisition is the process through which individuals or organizations obtain, assimilate, and apply new information or skills. It is crucial for personal development, organizational growth, and societal progress. Knowledge acquisition can occur through various means such as formal education, training programs, experiential learning, and information dissemination. In the United States, for example, statistics show a significant emphasis on higher education as a means of knowledge acquisition. According to data from the National Center for Education Statistics (NCES), enrollment in degree-granting postsecondary institutions in the U.S. increased from 17.5 million in fall 2000 to 19.9 million in fall 2019 (NCES, 2021). This reflects a growing commitment to formal education as a pathway to acquiring knowledge. Additionally, the rise of online learning platforms and Massive Open Online Courses (MOOCs) has expanded access to education, facilitating knowledge acquisition for individuals across diverse demographics (Smith & Brame, 2013).

In the United Kingdom, knowledge acquisition is supported by a strong tradition of academic excellence and research-driven education. Universities such as Oxford and Cambridge are globally renowned for their contributions to knowledge generation and dissemination. Data from the Higher Education Statistics Agency (HESA) reveals that in the academic year 2019/2020, there were over 2.5 million students enrolled in higher education institutions in the UK (HESA, 2021). This underscores the significance of formal education in knowledge acquisition within the UK context. Furthermore, initiatives such as the Knowledge Transfer Partnerships (KTP) program facilitate collaboration between academia and industry, fostering the application of research findings to real-world problems (Bennett, O'Flynn & Van Dooren, 2016).

In Japan, knowledge acquisition is deeply ingrained in the cultural emphasis on lifelong learning and continuous improvement. The Japanese government invests heavily in education and training programs to ensure a highly skilled workforce capable of driving innovation and economic growth. According to data from the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan's expenditure on education amounted to 3.8% of GDP in 2019 (MEXT, 2021). This investment supports initiatives such as vocational training programs, apprenticeships, and professional development courses, facilitating knowledge acquisition at various stages of individuals' careers (Baba & Hisamatsu, 2018).

In Brazil, knowledge acquisition is a critical component of efforts to address socioeconomic inequalities and promote sustainable development. The Brazilian government has implemented policies to expand access to education and training opportunities, particularly among marginalized communities. According to the Brazilian Institute of Geography and Statistics (IBGE), the literacy rate among individuals aged 15 years and older increased from 88.6% in 2012 to 93.2% in 2019 (IBGE, 2020). This reflects progress in promoting basic literacy skills as a foundation for further knowledge acquisition. Moreover, initiatives such as the Science without Borders program have provided scholarships for Brazilian students to study abroad, facilitating exposure to international perspectives and fostering knowledge exchange (Garcia & Eiras, 2019).

In African countries, knowledge acquisition is central to addressing developmental challenges and harnessing the continent's human capital potential. Access to quality education and training remains a key priority for many African governments and international organizations. According to UNESCO Institute for Statistics (UIS) data, the gross enrollment ratio in tertiary education in sub-Saharan Africa increased from 6.9% in 2012 to 10.1% in 2019 (UIS, 2021). While this represents progress, disparities in access persist, particularly between urban and rural areas. Efforts to enhance educational infrastructure, expand scholarship programs, and promote vocational skills development are underway to strengthen knowledge acquisition across the continent (Karsenti & Collin, 2013). Knowledge

acquisition is a multifaceted process influenced by cultural, economic, and policy factors. Across the USA, United Kingdom, Japan, Brazil, and African countries, investments in education, training, and research contribute to fostering a knowledgeable society. However, challenges such as inequities in access and resource allocation persist, highlighting the need for continued efforts to promote inclusive and sustainable approaches to knowledge acquisition.

Gamification, a concept rooted in the application of game design elements and principles in non-game contexts, has garnered significant attention across various domains due to its potential to enhance engagement, motivation, and behavior change (Deterding, Dixon, Khaled & Nacke, 2011). At its core, gamification leverages intrinsic human desires for achievement, recognition, and progression to drive desired actions or outcomes (Werbach & Hunter, 2012). By incorporating elements such as points, badges, leaderboards, and rewards into activities or systems, gamification seeks to make mundane tasks more enjoyable and compelling, thereby increasing user participation and satisfaction (Hamari & Koivisto, 2015).

In the context of knowledge acquisition, gamification offers promising opportunities to transform traditional learning experiences into engaging and immersive journeys (Landers & Landers, 2014). By infusing educational content with game-like features, such as challenges, quests, and levels, learners are incentivized to actively explore, interact, and master new concepts or skills (Hamari & Koivisto, 2015). For instance, educational platforms like Khan Academy employ gamified elements such as progress tracking, badges for achievements, and personalized learning paths to motivate students to engage in self-directed learning (Kapp, 2012). Moreover, gamification can foster a sense of autonomy and competence among learners, key components of self-determination theory, which posits that intrinsic motivation flourishes when individuals perceive their actions as self-directed and effective (Ryan & Deci, 2000). By providing clear goals, immediate feedback, and opportunities for skill development, gamified learning environments empower learners to take ownership of their learning journey and experience a sense of mastery. This intrinsic motivation, in turn, can lead to deeper engagement, sustained effort, and ultimately, enhanced knowledge acquisition (Landers & Landers, 2014).

Furthermore, gamification has the potential to promote social interaction and collaboration, which are integral aspects of constructivist learning theories (Reeves & Malone, 2019). Through features such as multiplayer challenges, team-based competitions, and collaborative problem-solving activities, gamified learning environments encourage learners to share knowledge, exchange ideas, and work together towards common goals (Deterding, Dixon, Khaled & Nacke, 2011). This collaborative aspect not only enriches the learning experience but also facilitates peer learning and knowledge co-construction (Landers & Landers, 2014). Additionally, gamification enables educators to personalize learning experiences based on individual preferences, abilities, and progress (Nicholson, 2015). Through adaptive algorithms and learner analytics, gamified systems can dynamically adjust the difficulty level, content presentation, and learning pace to optimize engagement and effectiveness (Hamari & Koivisto, 2015). Personalization enhances relevance and meaningfulness, thereby increasing learners' intrinsic motivation and facilitating deeper knowledge acquisition (Landers & Landers, 2014).

Moreover, the immersive and experiential nature of gamification can facilitate situated learning, wherein knowledge is acquired within authentic contexts and applied in real-world scenarios. By simulating realistic challenges, simulations, or case studies, gamified learning environments enable learners to actively explore and practice skills in a safe and interactive manner (Kapp, 2012). This hands-on approach promotes active engagement, problem-solving skills, and transferability of knowledge to practical settings (Reeves & Malone, 2019). Furthermore, gamification can address

motivational barriers and increase persistence in learning endeavors. By providing tangible rewards, such as virtual badges, points, or unlockable content, gamified systems create a sense of achievement and progression, motivating learners to overcome challenges and persevere in their learning journey (Deci, 2017). This intrinsic motivation sustains interest and effort over time, mitigating boredom, frustration, and dropout rates commonly associated with traditional learning approaches.

Additionally, gamification can facilitate continuous feedback and reflection, essential components of self-regulated learning processes (Zimmerman, 2002). Through real-time performance metrics, progress indicators, and reflective prompts, gamified systems enable learners to monitor their own learning, identify areas for improvement, and set goals for mastery (Nicholson, 2015). This metacognitive awareness enhances self-efficacy and self-directed learning skills, contributing to more effective knowledge acquisition and retention (Landers & Landers, 2014). Gamification holds immense potential to revolutionize the landscape of knowledge acquisition by leveraging game design principles to create engaging, personalized, and immersive learning experiences. By tapping into intrinsic motivations, fostering collaboration, promoting personalized feedback, and facilitating experiential learning, gamified approaches have the power to enhance learner engagement, motivation, and ultimately, knowledge acquisition outcomes.

1.1 Statement of the Problem

The study arises from the growing interest in leveraging gamification techniques to enhance learning outcomes in educational and training contexts. Despite the increasing adoption of gamified approaches, there remains a need for empirical evidence to elucidate the effectiveness of gamification in promoting knowledge acquisition. According to a survey conducted by the Entertainment Software Association (ESA), 70% of teachers believe that educational games can be effective tools for motivating students and enhancing learning (ESA, 2020). However, the precise mechanisms through which gamification influences knowledge acquisition, as well as its comparative effectiveness across different learning environments and subject areas, remain poorly understood. This study seeks to address these research gaps by systematically examining the impact of gamification on knowledge acquisition and elucidating the underlying mechanisms driving its effects. The findings of this study hold implications for various stakeholders involved in education, training, and organizational learning. Educators and instructional designers can benefit from insights into how gamification strategies can be effectively integrated into curriculum design and instructional practices to optimize knowledge acquisition outcomes. By understanding which gamification elements are most conducive to learning and how they interact with individual learner characteristics, educators can tailor interventions to better engage and motivate students. Similarly, training professionals and human resource managers stand to gain valuable insights into how gamification can be leveraged to enhance employee training and development programs. By identifying effective gamification techniques for improving knowledge retention, skill acquisition, and performance outcomes, organizations can optimize their training investments and foster a culture of continuous learning and improvement. Ultimately, the findings of this study have the potential to inform evidence-based strategies for enhancing knowledge acquisition in diverse learning and training contexts, benefiting learners, educators, and organizations alike.

2.0 LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Self-Determination Theory (SDT)

Self-Determination Theory (SDT) is a psychological framework developed by Edward L. Deci and Richard M. Ryan that focuses on intrinsic motivation and human flourishing. SDT posits that individuals have three innate psychological needs: autonomy, competence, and relatedness. According

to SDT, when these needs are satisfied, individuals experience greater intrinsic motivation, engagement, and well-being. In the context of the impact of gamification on knowledge acquisition, SDT offers valuable insights into how gamified learning environments can fulfill these psychological needs, thereby enhancing learning outcomes. For example, by providing learners with autonomy in selecting learning activities, setting goals, and monitoring progress, gamification can increase intrinsic motivation and engagement (Ryan & Deci, 2000). Similarly, by offering opportunities for mastery and skill development, gamified systems can foster feelings of competence and self-efficacy, promoting deeper learning and knowledge acquisition. Additionally, by facilitating social interaction and collaboration through gamified challenges and leaderboards, learners can experience a sense of relatedness and belonging, further enhancing motivation and learning outcomes.

2.1.2 Cognitive Load Theory (CLT)

Cognitive Load Theory (CLT), proposed by John Sweller, focuses on how the cognitive load imposed by instructional materials or learning tasks affects learning outcomes. CLT distinguishes between three types of cognitive load: intrinsic, extraneous, and germane. Intrinsic cognitive load refers to the inherent complexity of the learning materials, extraneous cognitive load arises from poorly designed instructional methods or presentation formats, and germane cognitive load relates to the mental effort devoted to constructing new knowledge schemas or cognitive structures. In the context of gamification and knowledge acquisition, CLT is relevant in understanding how the design of gamified learning environments influences cognitive load and, consequently, learning outcomes. Effective gamification strategies should aim to minimize extraneous cognitive load by presenting information in a clear, coherent, and engaging manner, thus freeing cognitive resources for meaningful learning (Sweller, Ayres & Kalyuga, 2019). Moreover, gamification can be used to scaffold learning and manage intrinsic cognitive load by providing learners with step-by-step guidance, practice opportunities, and feedback, facilitating knowledge acquisition and retention.

2.1.3 Constructivism

Constructivism is a learning theory that emphasizes the active construction of knowledge by learners through meaningful interactions with the environment. Originating from the works of Jean Piaget and Lev Vygotsky, constructivism posits that learners actively engage in sense-making, knowledge construction, and meaning negotiation as they interact with new information and experiences. According to constructivism, learning is a social and situated process influenced by cultural contexts, prior knowledge, and social interactions. In the context of the impact of gamification on knowledge acquisition, constructivism highlights the importance of creating authentic and interactive learning environments that enable learners to explore, experiment, and collaboratively construct meaning (Duffy & Cunningham, 1996). Gamified learning environments can promote constructivist principles by providing learners with opportunities for active exploration, problem-solving, and peer interaction. For example, gamification can simulate real-world challenges, case studies, or problem-solving scenarios, allowing learners to apply theoretical knowledge in practical contexts and co-construct understanding through social interaction and collaboration. Thus, by aligning with constructivist principles, gamified approaches have the potential to enhance knowledge acquisition by fostering active engagement and deeper understanding.

2.2 Empirical Review

Smith & Johnson (2020) investigated the impact of gamified learning platforms on knowledge acquisition among college students. The researchers conducted a randomized controlled trial involving two groups of students: one group using a traditional learning platform and the other using a gamified learning platform. Pre- and post-tests were administered to assess knowledge acquisition. The findings

revealed that students in the gamified learning platform group demonstrated significantly higher levels of knowledge acquisition compared to those in the traditional learning platform group. The study suggested that integrating gamification into educational platforms can enhance knowledge acquisition outcomes among college students.

Chen & Wang (2019) explored the effectiveness of gamification in corporate training programs on knowledge acquisition and subsequent job performance. The researchers conducted a longitudinal study involving employees undergoing training, with one group exposed to gamified training modules and another group receiving traditional training. Knowledge tests and performance evaluations were conducted at regular intervals. The results indicated that employees who underwent gamified training exhibited higher levels of knowledge acquisition and demonstrated improved job performance compared to those in the traditional training group. The study recommended for the adoption of gamification strategies in corporate training programs to enhance knowledge acquisition and job performance among employees.

Li & Zhang (2018) conducted a meta-analysis aimed to synthesize findings from existing studies to assess the overall impact of gamification on knowledge acquisition in online courses. The researchers systematically reviewed and analyzed empirical studies on gamification in online courses, focusing on outcomes related to knowledge acquisition. Effect sizes were calculated and aggregated across studies. The meta-analysis revealed a moderate to large effect of gamification on knowledge acquisition in online courses, with gamified courses consistently outperforming non-gamified courses. The study underscored the potential of gamification to enhance knowledge acquisition in online learning environments and calls for further research to explore optimal gamification strategies.

Park & Lee (2017) investigated the effectiveness of gamified training programs in healthcare settings on knowledge acquisition among medical professionals and subsequent patient outcomes. The researchers conducted a mixed-methods study, combining quantitative assessments of knowledge acquisition with qualitative evaluations of patient outcomes following gamified training interventions. The study found that medical professionals who underwent gamified training demonstrated significant improvements in knowledge acquisition, and patients treated by these professionals reported higher satisfaction levels and better health outcomes. The findings suggested that gamification can be a valuable tool in healthcare training to enhance knowledge acquisition among medical professionals and improve patient care.

Garcia & Martinez (2016) assessed the impact of gamified learning environments on knowledge acquisition among K-12 students. The researchers conducted a quasi-experimental study involving multiple classrooms, with some classes using gamified learning platforms and others using traditional methods. Pre- and post-tests were administered to measure knowledge acquisition. The results showed that students in the gamified learning environments exhibited significantly higher levels of knowledge acquisition compared to those in traditional classrooms. The study suggested that the integration of gamification into K-12 education as a means of enhancing knowledge acquisition and engagement among students.

Wang & Lee (2015) examined the effects of gamification on vocabulary acquisition and retention in language learning contexts. The researchers conducted a longitudinal study involving language learners, with one group using a gamified language learning app and another group using a traditional textbook-based approach. Vocabulary tests were administered at regular intervals. The study found that learners using the gamified app demonstrated higher levels of vocabulary acquisition and retention compared to those using traditional methods. The findings suggested that gamification can be an effective strategy for promoting vocabulary acquisition and retention in language learning contexts.

Chen & Wu (2014) explored the effects of gamification on knowledge acquisition and interest in science subjects among students in STEM (Science, Technology, Engineering, and Mathematics) disciplines. The researchers conducted a mixed-methods study, combining quantitative assessments of knowledge acquisition with qualitative inquiries into students' attitudes and interest in science following gamified learning interventions. The study found that students exposed to gamified STEM learning environments showed higher levels of knowledge acquisition and increased interest in science compared to those in traditional classrooms. The findings suggested that integrating gamification into STEM education can enhance knowledge acquisition and foster a deeper interest in science among students.

3.0 METHODOLOGY

The study adopted a desktop research methodology. Desk research refers to secondary data or that which can be collected without fieldwork. Desk research is basically involved in collecting data from existing resources hence it is often considered a low cost technique as compared to field research, as the main cost is involved in executive's time, telephone charges and directories. Thus, the study relied on already published studies, reports and statistics. This secondary data was easily accessed through the online journals and library.

4.0 FINDINGS

This study presented both a contextual and methodological gap. A contextual gap occurs when desired research findings provide a different perspective on the topic of discussion. For instance, Wang & Lee (2015) examined the effects of gamification on vocabulary acquisition and retention in language learning contexts. The researchers conducted a longitudinal study involving language learners, with one group using a gamified language learning app and another group using a traditional textbook-based approach. Vocabulary tests were administered at regular intervals. The study found that learners using the gamified app demonstrated higher levels of vocabulary acquisition and retention compared to those using traditional methods. The findings suggested that gamification can be an effective strategy for promoting vocabulary acquisition and retention in language learning contexts. On the other hand, the current study focused on investigating the impact of gamification on knowledge acquisition.

Secondly, a methodological gap also presents itself, for example, Wang & Lee (2015) conducted a longitudinal study involving language learners, with one group using a gamified language learning app and another group using a traditional textbook-based approach. Vocabulary tests were administered at regular intervals; in examining the effects of gamification on vocabulary acquisition and retention in language learning contexts. Whereas, the current study adopted a desktop research method.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Through a rigorous examination of empirical evidence from various studies, it is evident that gamification holds significant promise as a strategy to optimize learning outcomes. The findings consistently indicate that integrating gamification elements into educational platforms and training programs leads to improvements in knowledge acquisition among learners. Whether in higher education, corporate training, healthcare, or K-12 education, gamified learning environments consistently outperform traditional methods in facilitating the acquisition of new knowledge and skills.

One of the key conclusions drawn from this study is the positive impact of gamification on learner motivation and engagement, which in turn contributes to enhanced knowledge acquisition. By leveraging game design elements such as points, badges, leaderboards, and rewards, gamified learning environments create a sense of challenge, accomplishment, and progression that motivates learners to

actively participate and persist in their learning endeavors. This intrinsic motivation fosters deeper engagement with the learning materials, leading to more effective knowledge acquisition. Moreover, the social interaction and collaborative aspects inherent in gamified environments further enhance motivation and facilitate knowledge sharing among learners, thereby enriching the learning experience.

Furthermore, the findings underscore the importance of designing gamified learning experiences that are aligned with instructional goals and tailored to the needs and preferences of the target audience. Effective gamification strategies should strike a balance between challenge and skill, provide meaningful feedback, and offer opportunities for mastery and autonomy. Additionally, considerations such as learner demographics, cultural factors, and subject matter relevance should inform the design and implementation of gamified learning interventions. By adopting a user-centered approach and continuously iterating on design based on feedback and evaluation, educators and instructional designers can maximize the impact of gamification on knowledge acquisition.

The evidence presented in this study highlights gamification as a promising approach to enhancing knowledge acquisition in educational and training settings. By tapping into intrinsic motivations, promoting active engagement, and fostering collaborative learning experiences, gamified learning environments offer a compelling alternative to traditional instructional methods. However, further research is warranted to explore optimal gamification strategies, assess long-term effects on knowledge retention and transfer, and identify potential challenges and limitations. Ultimately, by harnessing the power of gamification, educators, trainers, and organizations can unlock new opportunities for facilitating effective learning and skill development in the digital age.

5.2 Recommendations

Firstly, the study suggests that educational institutions and organizations should consider integrating gamification elements into their learning and training programs to enhance knowledge acquisition outcomes. By incorporating game-like features such as points, badges, challenges, and rewards into educational materials and platforms, instructors can create more engaging and interactive learning experiences. This recommendation aligns with the growing body of research indicating the positive effects of gamification on motivation, engagement, and learning outcomes. Additionally, the study emphasizes the importance of aligning gamification strategies with specific learning objectives and the needs of the target audience to maximize effectiveness.

Secondly, the study recommends that educators and instructional designers leverage gamification to promote active learning and problem-solving skills. By designing gamified learning activities that require learners to apply knowledge in contextually relevant scenarios or solve real-world challenges, instructors can facilitate deeper understanding and retention of content. For example, incorporating simulation games, case studies, or virtual labs into curriculum designs can provide learners with opportunities to explore complex concepts in a hands-on and experiential manner. Furthermore, the study suggests that gamification can be used to foster collaboration and peer learning through multiplayer games or team-based challenges, enabling learners to share knowledge, exchange ideas, and collectively solve problems.

Thirdly, the study recommends that organizations invest in the development of gamified training programs to enhance knowledge acquisition and skill development among employees. By incorporating gamification elements such as progress tracking, leaderboards, and performance-based rewards into training modules, companies can create a more engaging and effective learning environment. Moreover, the study highlights the potential of gamification to address common challenges in employee training, such as low motivation, high dropout rates, and limited transfer of

learning to the workplace. For instance, gamified training programs can provide employees with immediate feedback on their performance, personalized learning paths, and opportunities for continuous practice and reinforcement, leading to improved knowledge acquisition and job performance.

Lastly, the study underscores the importance of ongoing research and evaluation to better understand the mechanisms underlying the impact of gamification on knowledge acquisition. While existing studies have demonstrated the positive effects of gamification on motivation and engagement, more research is needed to identify optimal gamification strategies, factors influencing effectiveness, and potential drawbacks or limitations. Additionally, the study emphasizes the need for longitudinal studies and real-world implementations to assess the long-term effects of gamification on learning outcomes and behavior change. By continuously monitoring and adapting gamification interventions based on empirical evidence and feedback from learners, educators, and practitioners, organizations can optimize the effectiveness of gamified approaches in promoting knowledge acquisition and improving educational and training outcomes.

REFERENCES

Baba, Y., & Hisamatsu, S. (2018). Lifelong learning and work in Japan: Challenges for youth. In L. De Lisi & M. Ferrari (Eds.), International handbook of psychology in education (pp. 441-467). Springer. DOI: 10.1007/978-3-319-77407-4_23

Bennett, D., O'Flynn, J., & Van Dooren, W. (2016). Knowledge transfer partnerships: A UK program supporting innovation through collaboration. Journal of Product Innovation Management, 33(3), 370-387. DOI: 10.1111/jpim.12266

Chen, L., & Wang, Q. (2019). Gamification in Corporate Training: Impact on Knowledge Acquisition and Job Performance. International Journal of Training and Development, 23(4), 289-305.

Chen, W., & Wu, L. (2014). The Role of Gamification in STEM Education: Effects on Knowledge Acquisition and Interest in Science. Journal of STEM Education, 15(2), 93-108.

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: Envisioning Future Media Environments (pp. 9-15). DOI: 10.1145/2181037.2181040

Duffy, T. M., & Cunningham, D. J. (1996). Constructivism: Implications for the design and delivery of instruction. In D. H. Jonassen (Ed.), Handbook of research for educational communications and technology (pp. 170-198). Macmillan.

Entertainment Software Association (ESA). (2020). Essential facts about the video game industry. Retrieved from https://www.theesa.com/esa-research/

Garcia, A., & Eiras, A. (2019). Science without borders program: Analysis of the first phase and reflections on the possibilities of internationalization in Brazilian higher education. Higher Education for the Future, 6(2), 145-164. DOI: 10.1177/2347631119835587

Garcia, R., & Martinez, E. (2016). Effects of Gamified Learning Environments on Knowledge Acquisition in K-12 Education. Educational Technology Research and Development, 64(5), 987-1003.

Hamari, J., & Koivisto, J. (2015). "Working out for likes": An empirical study on social influence in exercise gamification. Computers in Human Behavior, 50, 333-347. DOI: 10.1016/j.chb.2015.04.018

HESA. (2021). Higher education student statistics: UK, 2019/20. Higher Education Statistics Agency. Retrieved from https://www.hesa.ac.uk/data-and-analysis/students/who-studies-in-he

IBGE. (2020). Pesquisa Nacional por Amostra de Domicílios Contínua - PNAD Contínua. Instituto Brasileiro de Geografia e Estatística. Retrieved from https://www.ibge.gov.br/estatisticas/sociais/educacao/17270-pnad-continua.html?=&t=o-que-e

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

Karsenti, T., & Collin, S. (2013). Distance learning in sub-Saharan Africa: Constraints, challenges, and opportunities. Journal of Educational Technology & Society, 16(3), 215-225.

Li, M., & Zhang, J. (2018). Exploring the Role of Gamification in Online Courses: A Meta-Analysis. Computers & Education, 123, 161-175.

MEXT. (2021). Statistics of education, culture, sports, science, and technology. Ministry of Education, Culture, Sports, Science and Technology, Japan. Retrieved from https://www.mext.go.jp/en/policy/education/education/highered/title01/detail01/sdetail01/1373897.htm

NCES. (2021). Fast facts: Back to school statistics. National Center for Education Statistics. Retrieved from https://nces.ed.gov/fastfacts/display.asp?id=372

Nicholson, S. (2015). A recipe for meaningful gamification. In K. Margolis & P. Goodyear (Eds.), The Routledge Companion to Mobile Media (pp. 421-432). Routledge.

Park, H., & Lee, S. (2017). Gamification in Healthcare Training: Impact on Knowledge Acquisition and Patient Outcomes. Journal of Medical Education, 21(2), 145-162.

Reeves, B., & Malone, T. W. (2019). Leadership's online labs: Business wargames and their role in leadership development. Harvard Business Review Press.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American Psychologist, 55(1), 68-78.

Smith, A., & Johnson, B. (2020). The Effects of Gamified Learning Platforms on Knowledge Acquisition in Higher Education. Journal of Educational Technology, 43(3), 321-336.

Sweller, J., Ayres, P., & Kalyuga, S. (2019). Cognitive load theory. Springer.

Wang, Y., & Lee, J. (2015). Gamification in Language Learning: Impact on Vocabulary Acquisition and Retention. Language Learning & Technology, 19(3), 64-78.

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

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. Theory into Practice, 41(2), 64-70. DOI: 10.1207/s15430421tip4102_2