REVIEW ON GAMIFICATION ON LEARNING AND TEACHING

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A B S T R A C T

The implementation of gamification in learning and instruction is looked as if it would have mass attractiveness among the learners in interesting motivation, learner commitment and social influence. This study is an attempt to gift a outline of the experiential findings of progressive literature in the emerging field of gamification at intervals the academic domain of learning and instruction[1,2]. It reveals the latest scientific research evidence on the emerging trends of learning technologies and gamification plugins beside extending the chances for future analysis directions in revolutionizing learning and instruction through gamification. This study not exclusively tries to shed light-weight on the novelty of gamified learning perceived as a game-changer and key enabler of motivation, engagement, and user expertise but also sought to outline the key challenges and barriers of gamification[3,4].

Keywords: gamification, motivation, engagement, learning.

I INTRODUCTION

Gamification and game-based education are very popular mobile and technological trends that use game elements to endorse desired behaviours and impel community learning outcomes. This process is built on constructivist learning, which predicates the necessitate for empirical learning via social interaction with the environment and peers [1] . The term 'game-based learning' portrays the use of gamified substance as an e-learning technique to meet instructional goals [2] . In a corporate environment, organisational learning relates to strategic objectives with a serious purpose, despite the level of game based technology involved. For instance, word games use semantic and phonological skills to forge important connections between words, along with helping learners to expand their vocabulary and develop better language skills [3]. Similarly, strategy-based math games and logic puzzles like *Math Playground* can help hone learners' logical thinking.

II SCIENTFIC DEFINITION OF GAMFICATION

The scientific definition of gamification is defined as the process of applying game elements to non-game contexts ([4,5,6,7]. game elements in various fields of study are levels, points, badges, leader boards and avatars[8]. Many other mechanisms are also available on gamified systems, such as combat, content unlocking, gifting, boss fights, quests, social graphs, certificates and memes [9]. These mechanisms, known in gamification as 'elements', stimulate learners to achieve greater goal orientation by increasing their persistence, learning by repetition, engaging in collaboration and evoking fun and friendly competition with peers [10]. The pioneering studies of the gamification concept featured in [11] and the origins of the '*Serious Games Initiative*' outlined in[12] , were viewed as the initiatives taken towards creating the awareness and encouraging the broader public to consider the use of serious game-based approaches within an educational context since game elements affordances impact learners motivation, engagement, and social influence [13]. With the onset of gamification in education, [14]further emphasised that the systematic deployment of gamified learning techniques would potentially drive new breakthroughs in gamification research.

There is growing evidence to suggest that gamification is increasingly being accepted as an effective learning strategy used to create highly engaging learning experiences. Based on the empirical evidence of recent studies, the success of digital games in education has sought to validate the effects of gamification in support of its potential to improve motivation, engagement and social influence while allowing students' to immerse in experiential learning [15,16,17]. In recent years, gamification has created a widespread interest among academicians and networks of researchers, prompting them to purposefully explore the gamut of gamified elements used as part of the instructional design process to deliver engaging experiences and enhance programmes [18,19,20]Despite its technological developments and sig- nificant impact on learning and instruction, supporting and maintaining engagement in gamification pedagogies remain challenging [21,22]. Moreover, with gamification being a relatively new concept in the educational sector [23,24], we believe that problems that arise must be addressed to develop a more mature understanding of its nature and process.

III GAMIFICATION IN EDUCATIONAL RESEARCH

After entering a scientific debate concerning gamification in educational research, a critical review of state-of-the-art literature in the nascent field of gamification uncovered critical research gaps that inadvertently raised perspectives for future research. The seminal work of [25] on gamified learning highlights the need for establishing a strong theoretical foundation for gamification. Edgar Dale theorised his "*Cone of Experience*" (1969) in instructional design as an analogy that provides a concrete basis for reinforcing optimal learning, heightening students' sense of achievement and encouraging high levels of engagement, which in turn facilitates better knowledge, retention and recall [26]. Considering the novelty of gamified learning strategized within the field of educational technology, [27]_further suggest that Dale's Cone lends itself privy to the anticipated direction of instructional design. Past seminal studies illustrate how a sound theoretical foundation and robust methodological approach can spur scientific and educational rigor. An extensive review of state-of-the-art literature has demonstrated that empirical research can be of implicit help for future studies by way of conceptualising theoretical frameworks and

identifying relevant methods, amongst other potential benefits. A summary of the systematic state-of-the-art literature review forges pathways for emerging research that is in line with previous educational research studies [28]

IV GAMIFICATION IMPACTS ON LEARNING AND INSTRUCTION

Gamification can be a powerful motivator, but only when used as part of a robust engagement strategy. Several studies have reported that the use of game principles as external incentives or rewards successfully addresses learners' extrinsic motivation [29]. This finding is in line with that of [30] , who found that the gamification concept successfully granted students a huge amount of extrinsic motivation but not intrinsic motivation. From a pedagogical perspective, it is believed that the provision of extrinsic rewards will likely damage intrinsic motivation [31]. Meanwhile, some authors have claimed that gamification influences both extrinsic and intrinsic motivation [32]. As the principles of games are innately enjoyable and fun for players, these values are typically connected to intrinsic motivation. Thus, the positive value created by attracting, motivating, engaging and retaining users' behaviour in the gamified learning process is considered to be an intrinsic motivation [19]. Gamification studies have reported improvements not only in students' motivation and engagement, but also in their learning achievement. The principle of 'challenge' in a gamified system makes a significant contribution to positive learning achievements [33]. Numerous strategies describe the adaptation of gamified concepts to enhance students' positive learning outcomes. Integrating this concept into contemporary pedagogical instruction such as flipped learning could be an alternative and effective strategy to enhance students' learning achievement, as reported in some studies [34], or in the context of the Wiki classroom [11] and MOOCs [3]. The analysis indicated that the enhancements to students' learning achievement reported in numerous studies were achieved by integrating gamification into the grading process or as a tool for innovative assessment. The tool most frequently used was a gamified formative assessment system, which provided im- mediate and effective feedback. In line with this, most publications, particularly in experimental research studies, have reported that gamified assessment improved students' feedback and scores relative to conventional assessment without gamification. The notion of a gamified system facilitates peer-based feedback with social learning activities and collaborative learning cultures and is a worthy means to induce users to increase their interactivity and connectivity [14,13]. Numerous studies have shown that gamification should be imbued with various types of game design elements to create engaging gamification services that afford social interaction and socialisation amongst students [16,8,9]Team leader boards were considered as the third most engaging gamification element after virtual gifts and points due to their benefits in promoting social connection amongst users. This element led students to engage in strong social connectivity via competition and comparison of points and scores on the leader boards [22].

V CHALLENGES AND BARRIERS OF GAMIFICATION

A study of [34] reported that badges did not successfully increase intrinsic motivation during the instructional period. Other studies claimed that the use of points, badges, levels and leader boards failed to promote students' sense of community and did not sig- nificantly increase students' competence, their need for satisfaction and intrinsic motivation [35]. These findings also suggest

that gamification is not always appropriate for all types of content. On that note, it is important for instructional designers to acquire an empirically grounded understanding of the content, learning goals and outcomes, when weighing up each option of gamification. Another crucial aspect of the gamification research agenda raised by [36]is the scarcity of instructional and motivational design theories to support the thresholds of gamification, since most of the studies focused on motivational affordances that invoke gameful experiences, desirable for learning. From a theoretical and comparative perspective, these design theories re- present the emergent interest in elucidating gamification concepts and strategies aimed at readdressing the needs of users [37].

CONCLUSIONS

The traditional chalk and talk method of classroom delivery seems increasingly old-fashioned. In current times, students' learning spaces have gone beyond the typical brick and mortar classroom. In the digital era, forging global connections is as easy as clicking a button or using easy voice commands, enabling people to gain quick access to any type of information from various digital sources. The continuous advancement of technology will require students to increase their learning. Therefore, teachers or instructors should be trained in a variety of contemporary methods and instructional pedagogies, not limited to gamification, such as flipped classroom, blended learning, adaptive learning, inquiry-based learning and more; the most recent trends in digitalisation (augmented and virtual reality, artificial intelligence and big data, emotion sensors, learning analytics, massive open online courses, smart desks)[37]. In this way, teachers could implement the right instruction and technology at the right time and in the right place.

REFERENCES

[1] York, J., & deHaan, J. W. (2018). A constructivist approach to game-based language learning: Student perceptions in a beginner-level EFL context. *International Journal of Game-Based Learning*, *8*(1), 19–40. https://doi.org/10.4018/IJGBL.2018010102.

[2] De-Marcos, L., Garcia-Lopez, E., & Garcia-Cabot, A. (2016). On the effectiveness of game-like and social approaches in learning: Comparing educational gaming, gamification & social networking. *Computers & Education*, *95*, 99–113. https://doi.org/10.1016/j.compedu.2015.12.008.

[3] Wu, M. L., Richards, K., & Saw, G. K. (2014). Examining a massive multiplayer online role-playing game as a digital game-based learning platform. *Computers in the Schools*, *31*(1–2), 65–83. https://doi.org/10.1080/07380569.2013.878975.

[4] Zimmerling, E., Höllig, C. E., Sandner, P. G., & Welpe, I. M. (2019). Exploring the influence of common game elements on ideation output and motivation. *Journal of Business Research*, *94*, 302–312. https://doi.org/10.1016/j.jbusres.2018.02.030.

[5]Schöbel, S., Janson, A., Jahn, K., Kordyaka, B., Turetken, O., Djafarova, N., et al. (2020). A research agenda for the why, what, and how of gamification designs results on an ECIS 2019 panel. *Communications of the association for information systems*.

[6] Ding, L., Er, E., & Orey, M. (2018). An exploratory study of student engagement in gamified online discussions. *Computers & EDUCATION, 120*, 213–226. https://doi.org/ 10.1016/j.compedu.2018.02.007.

[7] 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.

[8] Barata, G., Gama, S., Jorge, J., & Gonçalves, D. (2017). Studying student differentiation in gamified education: A long-term study. *Computers in HUMAN BEHAVIOR, 71*, 550–585. https://doi.org/10.1016/j.chb.2016.08.049.

[9] Buckley, P., & Doyle, E. (2017). Individualising gamification: An investigation of the impact of learning styles and personality traits on the efficacy of gamification using aprediction market. *Computers & EDUCATION, 106*, 43–55. https://doi.org/10.1016/j.compedu.2016.11.009.

[10] Ding, L., Kim, C., & Orey, M. (2017). Studies of student engagement in gamified online discussions. *Computers & EDUCATION, 115*, 126–142. https://doi.org/10.1016/j. compedu.2017.06.016.

[11] Barata, G., Gama, S., Fonseca, M. J., & Gonçalves, D. (2013, October). Improving student creativity with gamification and virtual worlds. *Proceedings of the first INTERNATIONAL conference on GAMEFUL design, RESEARCH, AND APPLICATIONS. GAMIFICATION '13* (pp. 95–98). Stratford, ON, Canada: ACM Press. https://doi.org/10.1145/ 2583008.2583023.

[12] Adukaite, A., van Zyl, I., Er, Ş., & Cantoni, L. (2017). Teacher perceptions on the use of digital gamified learning in tourism education: The case of South African secondary schools. *Computers & EDUCATION, 111*, 172–190. https://doi.org/10.1016/j.compedu.2017.04.008.

[13] Aldemir, T., Celik, B., & Kaplan, G. (2018). A qualitative investigation of student perceptions of game elements in a gamified course. *Computers in HUMAN BEHAVIOR, 78*, 235–254. https://doi.org/10.1016/j.chb.2017.10.001.

[14] Zatarain Cabada, R., Barrón Estrada, M. L., Ríos Félix, J. M., & Alor Hernández, G. (2018). A virtual environment for learning computer coding using gamification and emotion recognition. *INTERACTIVE LEARNING Environments*, 1–16. https://doi.org/10.1080/10494820.2018.1558256.

[15] Wu, M. L., Richards, K., & Saw, G. K. (2014). Examining a massive multiplayer online role-playing game as a digital game-based learning platform. *Computers in the Schools, 31*(1–2), 65–83. https://doi.org/10.1080/07380569.2013.878975.

[16] Baydas, O., & Cicek, M. (2019). The examination of the gamification process in undergraduate education: A scale development study. *Technology,*

Pedagogy and Education, *28*(3), 1–17. https://doi.org/10.1080/1475939X.2019.1580609.

[17] Bereczki, E. O., & Karpati, A. (2018). Teachers' beliefs about creativity and its nurture: A systematic review of the recent research literature. *Educational Research Review*, *23*, 25–56. https://doi.org/10.1016/j.edurev.2017.10.003.

[18] Bouchrika, I., Harrati, N., Wanick, V., & Wills, G. (2019). Exploring the impact of gamification on student engagement and involvement with e-learning systems.*Interactive Learning Environments*, 1–14. https://doi.org/10.1080/10494820.2019.1623267.

[19] Qian, M., & Clark, K. R. (2016). Game-based learning and 21st century skills: A review of recent research. *Computers in Human Behavior*, *63*, 50–58. https://doi.org/10.1016/j.chb.2016.05.023.

[20] Rachels, J. R., & Rockinson-Szapkiw, A. J. (2018). The effects of a mobile gamification app on elementary students' Spanish achievement and self-efficacy. *Computer Assisted Language Learning*, *31*(1–2), 72–89. https://doi.org/10.1080/09588221.2017.1382536.

[21] Rapp, A., Hopfgartner, F., Hamari, J., Linehan, C., & Cena, F. (2019). Strengthening gamification studies: Current trends and future opportunities of gamification research. *International Journal of Human-Computer Studies*, *127*, 1–6. https://doi.org/10.1016/j.ijhcs.2018.11.007.

[22] Subhash, S., & Cudney, E. A. (2018). Gamified learning in higher education: A systematic review of the literature. *Computers in Human Behavior*, *87*, 192–206. https:// doi.org/10.1016/j.chb.2018.05.028.

[23] Sung, H., & Hwang, G. (2013). A collaborative game-based learning approach to improving students' learning performance in science courses. *Computers & Education*, *63*, 43–51. https://doi.org/10.1016/j.compedu.2012.11.019.

[24] Toda, A. M., do Carmo, R. M., da Silva, A. P., Bittencourt, I. I., & Isotani, S. (2019). An approach for planning and deploying gamification concepts with social networks within educational contexts. *International Journal of Information Management*, *46*, 294–303. https://doi.org/10.1016/j.ijinfomgt.2018.10.001.

[25] Toda, A. M., Valle, P. H., & Isotani, S. (2018). The dark side of gamification: An overview of negative effects of gamification in education. *Communications in Computer and Information Science*, *832*, 143–156. https://doi.org/10.1007/978-3-319-97934-2_9.

[26] Tsay, C. H. H., Kofinas, A., & Luo, J. (2018). Enhancing student learning experience with technology-mediated gamification: An empirical study. *Computers & Education*, *121*, 1–17. https://doi.org/10.1016/j.compedu.2018.01.009

[27] Ding, L. (2019). Applying gamifications to asynchronous online discussions: A mixed methods study. *Computers in Human Behavior*, *91*, 1–11. https://doi.org/10.1016/ j.chb.2018.09.022.

[28] Ding, L., Er, E., & Orey, M. (2018). An exploratory study of student engagement in gamified online discussions. *Computers & EDUCATION, 120*, 213–226. https://doi.org/ 10.1016/j.compedu.2018.02.007.

[29] Ding, L., Kim, C., & Orey, M. (2017). Studies of student engagement in gamified online discussions. *Computers & EDUCATION, 115*, 126–142. https://doi.org/10.1016/j. compedu.2017.06.016.

[30] 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.

[31] Doumanis, I., Economou, D., Sim, G. R., & Porter, S. (2019). The impact of multimodal collaborative virtual environments on learning: A gamified online debate.*Computers & EDUCATION, 130*, 121–138. https://doi.org/10.1016/j.compedu.2018.09.017.

[32] Yildirim, I. (2017). The effects of gamification-based teaching practices on student achievement and students' attitudes toward lessons. *The Internet AND Higher EDUCATION, 33*, 86–92. https://doi.org/10.1016/j.iheduc.2017.02.002.

[33] Vygotsky, L. (1978). *Mind in society: The development of higher PSYCHOLOGICAL processes.* Cambridge: Harvard University Press.

[34] Wang, F., & Hannafin, M. J. (2005). Design-based research and technology-enhanced learning environments. *EDUCATIONAL Technology RESEARCH & Development, 53*(4), 5–23. https://doi.org/10.1007/BF02504682.

[35] Wood, L. C., & Reiners, T. (2015). Gamification. *ENCYCLOPEDIA of INFORMATION science AND technology* (pp. 3039–3047). (3rd ed.). . https://doi.org/10.4018/978-1-4666- 5888-2.ch297 hershey: IGI global.

[36] Groening, C., & Binnewies, C. (2019). 'Achievement unlocked!' – the impact of digital achievements as a gamification element on motivation and performance. *Computers in HUMAN BEHAVIOR, 97*, 151–166. https://doi.org/10.1016/j.chb.2019.02.026.

[37] Hainey, T., Connolly, T. M., Boyle, E. A., Wilson, A., & Razak, A. (2016). A systematic literature review of games-based learning empirical evidence in primary education. *Computers & EDUCATION, 102*, 202–223. https://doi.org/ 10.1016 /j.compedu .2016.09.001.