



Pros and Cons of Tomorrow's Learning: A Review of Literature of Gamification in Education Context

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Abstract

Gamification in learning alleviates some current educational difficulties, including decreased student engagement, motivation and a lack of cooperation among students. As a result, gamification can enhance students' engagement, increase their motivation toward learning, promote collaboration among peers, aid with knowledge retention, provide instant feedback, and establish a positive, personalized learning environment. On the other hand, some challenges in applying gamification in education include being expensive to develop, diminish in value over time, assessment challenges, retaining information, cheating, and regulatory and legal issues. Therefore, training through games can simultaneously accommodate different types of training methods, each of which will have advantages and disadvantages according to the characteristics that should be considered when using the game method. Games in the workplace are a great tool if used properly. Instructional designers must consider the pros and cons before jumping into game development. Ensuring it fits with the learning outcomes will lead to a successful game.

Key Words: Cons, Education, Gamification, Tomorrow's Learning, Pros.

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1- INTRODUCTION

In the last few decades, the spread of gamification in various fields and its effectiveness has led to the use of gamification in educational environments and to teach various subjects. The simplest reason for using gamification in education is that gamified learning is fun, enhancing learning; in this case, learners spend more time learning. Although game-based education is not a new concept, the recent popularity of video games and the widespread use of personal computer technologies have accelerated the investigation and application of these games for educational purposes. In fact, one of the learner-centered methods to make learning and teaching attractive is gamification (1, 2). Gamification, broadly defined, is the process of defining the elements that comprise games, making those games fun, and motivating players to continue playing, and then using those same elements in a non-game context to influence behaviour (3, 4).

There are two forms of gamification: structural, which means no changes to the subject matter, and the altered content method that adds subject matter (1). Gamification is the strategic attempt to enhance systems, services, organizations, and activities by creating similar experiences to those experienced playing games to motivate and engage users. This is generally accomplished by applying game-design elements and game principles (dynamics and mechanics) in non-game contexts (5, 6). Games applied in learning can be considered serious games or games where the learning experience is centred on serious stories (7). Game design elements are the basic building blocks of gamification applications. These typical game design elements are points, badges, leaderboards, performance graphs, meaningful stories, avatars, and teammates (3, 8). According to the supporters of using games for learning, education provided

through games leads to acquiring knowledge and includes other aspects of life such as skills, beliefs and habits (9). The gamification of the game is due to the presentation and combination of elements such as goal, competition, cooperation, freedom of action to experience failure, as well as game mechanics such as avatar, medal, point system, stage, etc., which motivates the learner to do the activity (10). Despite the many advantages that have been counted for the game, it is important to pay attention to the fact that in the matter of educational planning and game design, along with the positive points of the games, the weaknesses and limitations should also be considered. Various studies show that if the game is not coordinated with the learning goals, it loses its importance and value and cannot be used in learning and teaching.

Considering the expansion of the use of gamification elements in education in developed and developing countries, since one of the first requirements for enthusiasts and researchers to enter any scientific field is to have a correct understanding of its field, therefore, reviewing the articles of each field of science, more than anything else, seems necessary for researchers and organizations to ensure the usefulness of the material and intellectual investment in a subject area and its practicality. So, this study aimed to review the pros and cons of gamification in the education context.

2- MATERIALS AND METHODS

We carried out a review of the literature on gamification in educational and learning contexts. Various design elements for gamification of education are discussed in these papers, along with their impact on the learners, which we refer to as learner outcomes. In this review, all papers evaluating the pros and cons of applying gamification in educational and learning contexts were searched on the

electronic databases of Scopus, EMBASE, Cochrane, Web of Science, ERIC, Wiley Online Library, and Medline (via PubMed) with no language or time restrictions (up to Jun 15, 2022). Two independent researchers performed the search process, and a supervisor resolved any discrepancies in this regard. The two reviewers initially reviewed the abstracts of searched articles, downloaded their full texts to review carefully, and selected the relevant studies independently.

Finally, the articles that met the inclusion criteria were enrolled in the review, and relevant references were reviewed to find further studies. The third reviewer resolved possible discrepancies. The criteria used in conducting a literature review were to choose a review theme, determine the appropriate article, conduct an analysis and synthesis of the literature, and review writing organization (11).

3- RESULTS

Gamification was introduced in the last decade and has focused on many different fields, including education (12). A game can be defined as a voluntary activity with rules and actors trying to achieve a goal within the framework of these rules. Game is accompanied by joy and pleasure, and this element distinguishes it from work. Learning through games can bring about the development of characteristics, advantages and disadvantages at the same time, some of which are briefly mentioned as following:

3-1. The Pros of Gamification

3-1-1. Background Theories

According to Kapp (2012), gamification is "using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems" (1). Gamification in learning alleviates some current

educational difficulties, including decreased student engagement, motivation and a lack of cooperation among students. The benefits of gamification lie in its congruence with two psychological theories; the Theory of Flow (13), and the Self-determination theory. Self-determination theory suggests that people are motivated to grow and change by three innate and universal psychological needs. This theory suggests that people can become self-determined when their needs for competence, connection, and autonomy are fulfilled (14, 15). Flow as a state of optimal experience characterized by being fully focused and engaged in an activity – has been regarded as one of the most important psychological outcomes of gamification and games. Designers of games and experiences have utilized the flow theory to understand users' activity better. The theory says that when a person is dealing with something challenging that he or she can handle, he or she enters a state of mind, a certain flow, where he or she is captivated, happy and eager, all at once (13). Moreover, game elements, such as scoreboards, rewards, quests, teams and leadership roles, all foster essential psychological needs. As a result, gamification can enhance students' engagement, increase their motivation toward learning, promote collaboration among peers, aid with knowledge retention and establish a positive, personalized learning environment (16).

3-1-2. Educational Capabilities of Gamification

Many researchers have investigated gamification's effect on learning and found a positive relationship between gamification and learning (17-25). When teachers use gamification, one of their considerations is whether gamification enhances students' learning achievements or not. Many researchers (19, 20, 26-28) have shown that gamification of learning can improve learning success. A large

systematic review of the literature regarding the application of gamification in Higher Education benefits was identified, such as positive effects on student engagement, attitude, performance and enjoyment, although these are mediated by the context and design (29).

3-1-3. Boosts Learner Engagement

Gamification makes learning fun and engaging, which means better employee training participation. By making learning fun, trainees can participate wholeheartedly. Games encourage friendly competition among colleagues. They make learners feel proud, completing a course after a series of gamified challenges and tasks. When learners feel emotionally connected to the content, their retention increases. Gamification makes learners want to achieve the learning objectives of a course. They want to know what comes next (30-32).

3-1-4. Increases Motivation

Motivation is the driving force that makes learners want to get to the end of the game and complete the learning. Badges are used as rewards at checkpoints throughout the game. They can be as simple as a sticker or fancier, like a Starbucks gift card for the first 100 students to complete the game successfully. Badges can be displayed within the game or on the company's website. They are a great technique because they make the user feel important and skilled. Badges give learners a sense of accomplishment (33-35).

3-1-5. Challenges

The gamification strategy challenges the participants to perform to the best of their abilities. Participants can be challenged to do better in different areas of interest. Thus, ensuring maximized potential (36, 37).

3-1-6. Immediate Feedback

Gamification of learning ensures instant feedback in all scenarios. This makes learning easier by giving them the right solution if they cannot find it themselves, and with the help of instant feedback, it becomes easier to find the domains that need more work. Leaderboards are another way of offering additional feedback. It lets learners see how they are doing compared to their colleagues (38-42).

3-1-7. Learning at an Individual Pace

Every individual has a different learning speed. Online training that includes gaming strategies allows learning at a pace suitable for the learner. By this, trainees can grasp the available knowledge according to their comfort level (43-45).

3-1-8. Social Interaction

While playing the intended games, the trainees interact with the trainer and other trainees, increasing social interaction (46-49).

3-1-9. Problem-solving

Solving complex problems is important for human development, but the problems are increasingly complex; gamification using game elements turns problem solving into a game and makes it more enjoyable and easier to solve (1).

3-1-10. Improve Hand-eye Coordination

Research supports the conclusion that video games enhance hand-eye coordination. Several studies show that the reaction time of gamers is faster than non-gamers, and playing even for less than fifteen minutes can improve hand-eye coordination. Research has shown that video game players are faster at searching and identifying stimuli presented in visual environments than those who do not play video games (50).

3-2. The Cons of Gamification

Considering all the advantages mentioned, the use of games in education is also accompanied by limitations that the educational designer should consider if she/he wants to use this method. This research reinforces the idea that knowing the challenges and barriers will help implementers of gamification to strategize for overcoming the obstacles that may come their way.

3-2-1. Expensive To Develop

A common opinion is that this type of technology is expensive to use. Games take longer to develop than traditional Instructional Design. If not well-designed, students' attitudes may be adversely affected. Time is money. It does not take much to go over budget because of the extra demand on time. Not to mention the cost of additional resources used to enhance the gameplay. Animations, graphics, stock photos and videos, music, and sound effects all cost money. The gamification of learning includes incurrance of additional cost, as it is not cheap to gamify learning scenarios. This includes buying the game and ensuring the system specification suits the game in question for it to run (51-53).

3-2-2. Diminished Value Over Time

Not only are games costly to develop, but they are also costly to maintain. It does not take long for cool games launched a few years ago to look dated. An outdated game may also lead employees to question if the content is outdated. Another disadvantage is the reference value of a game. Games are one-and-done, meaning that once a learner has completed the game, they do not want to repeat it if they need to reference some content. Depending on the content, a quick reference may also need to be created in addition to the game. This, of course, increases the project's cost (54-57).

3-2-3. Games That Are Only Poorly Masked Quizzes

Games are meant to be fun. Who enjoys taking quizzes and tests? Creating interactive, fun games that do not feel like quizzes pretending to be games takes time and creativity. Assessments in games need to link back to the learning objectives, just like any other eLearning course. Collecting points or stars may not be enough to motivate adult learners. Tokens, badges, or in-game prizes must be meaningful for the learner. However, successfully navigating a series of workplace challenges presented in an eLearning course could be so. Real-life scenarios, situations, and challenges related to the job are more effective than traditional quizzes and tests (58-60).

3-2-4. Pointsification

Some studies suggested that badges, competitions, Leaderboards, and points are the game design elements most often reported as causing negative effects. The most cited negative effects were lack of effect, lack of understanding, irrelevance, motivational issues, and worsened performance. The ethical issues of gaming the system and cheating were also often reported (61, 62).

3-2-5. Competition

The introduction of gaming in training scenarios propagates competitiveness. While competition is good for gaming scenarios, the organization requires its employees to cooperate (63-66).

3-2-6. Assessment Challenges

There is a gap between the course material and the games available on the market. It becomes the trainer's responsibility first to find the right game and then to find a way to translate the results of game progress to fulfilling objectives (67-72).

3-2-7. Retaining Information

While supporters may argue that students are more engaged and interested in learning when gamification is used, some see gaming as a way of bribing students. They learn the goals to unlock achievements; therefore, they are only learning for the sake of achieving a checkpoint of reaching a milestone. Students may not be retaining information but rather learning just enough to complete the challenge, then disposing of the information immediately after (68, 73).

3-2-8. Cheating

Another criticism is the potential for cheating within games, especially in education. There is little to stop a student from searching the internet or looking up an answer. If the games are the sole evaluation method, it becomes near impossible to determine which information a student actually knows and which information has been looked up. Although this is an issue across education due to the changing classroom landscape, gaming and especially the urge to win may increasingly drive students to cheat (72-76).

3-2-9. Frustration

Experts say that using gamification techniques in learning decreases learners' attention span. In addition, when they do not get instant gratification in real life, it can lead to frustration (77-79).

3-2-10. Regulatory and Legal Issues

Another criticism of gamification in the classroom involves the regulatory and legal issues and, ultimately, the ethics of introducing these concepts to students. Whenever students come into play, privacy should always be a concern of educators. Specifically, the amount of personal information students must share with the gaming program to access the material. Often, account creation involves a first and

last name, e-mail address, and other personal information. Holding the gaming site accountable for failing to protect student's personal information may be difficult. A second legal concern is the introduction of advertising and paid endorsements into the educational setting. While it is possible to find gaming systems that do not rely on outside funding, it is rare. This may lead to biased or advertiser-influenced content, which may or may not provide the most accurate setting for learning. Educators may have difficulty ensuring that all content is unbiased and without advertiser influence (80-86).

3-2-11. Effect Assessment

Some researchers claim that its recent development has not been sufficiently tested, as there has not been enough time to evaluate the long-term effects of this type of intervention (86, 87).

4- CONCLUSION

Due to the increasing progress of technology and information and communication technology, teaching methods have faced fundamental changes. Gamification is an example of these recently used changes in education. The use of this method has had significant effects on the amount of learning, participation and engagement and overall motivation. Due to the creation of dynamic interactions and the provision of various reinforcements, gamification can attract attention and teach new behaviour and skills to students. Applying gamification elements in education can add an attractive and playful aspect to learning. Because it is fun, gamification can be a good solution to solve learners' problems in the education context. A collection of research on gamification shows that most studies on gamification find it has positive effects on individuals. However, individual and contextual differences exist.

On the other hand, some challenges in applying gamification in education are: expensive to develop, diminish in value over time, require encouragement to complete, assessment challenges, retaining information, cheating, and regulatory and legal issues. Instructional designers must consider the pros and cons before jumping into game development. Ensuring it fits with the learning outcomes will lead to a successful game. Further evidence-based research needs to be carried out to objectively measure the effectiveness of gamification of learning across varying factors.

5- AUTHORS' CONTRIBUTIONS

Study conception or design: BM, and MB; Data analyzing and draft manuscript preparation: NK, AA, and SN; Critical revision of the paper: BM, and NK; Supervision of the research: MB and BM; Final approval of the version to be published: BM, NK, AA, SN, and MB.

6- CONFLICT OF INTEREST: None.

7- REFERENCES

1. Kapp, Karl. *The gamification of learning and instruction: Game-based methods and strategies for training and education*. San Francisco: Pfeiffer, 2012. ISBN 9781118096345.
2. Arnold, B. J. Gamification in education. *Proceedings of the American Society of Business and Behavioral Sciences*, 2014;21(1): 32-9.
3. Deterding, S., Dixon, D., Khaled, R., Nacke, L. From Game Design Elements to Gamefulness: Defining "Gamification". Paper presented at the 15th International Academic MindTrek Conference, Tampere, 2014. <https://dx.doi.org/10.1145/2181037.2181040>.
4. Armier, D. D., Jr., Shepherd, C. E., Skrabut, S. Using game elements to increase student engagement in course assignments. *College Teaching*, 2016;64(2): 64-72.
5. Sebastian Deterding; Dan Dixon; Rilla Khaled; Lennart Nacke. *From game design elements to gamefulness: Defining "gamification"*. *Proceedings of the 15th International Academic MindTrek Conference*, 2011; 9–15. doi:10.1145/2181037.2181040.
6. Robson, K., Plangger, K., Kietzmann, J., McCarthy, I. Pitt, L. "Is it all a game? Understanding the principles of gamification". *Business Horizons*. 2015;58 (4): 411–20.
7. Lugmayr, A, Suhonen, J, Hlavacs, H, Montero, C, Suutinen, E, Sedano, C. "Serious storytelling – a first definition and review". *Multimedia Tools and Applications*. 2016;76 (14): 15707–733. doi:10.1007/s11042-016-3865-5. S2CID 207219982.
8. Costa, C. J. (2019). Gamification. *OAE – Organizational Architect and Engineer Journal*. <https://doi.org/10.21428/b3658bca.8ffccebfc> Archived 2022-02-26 at the Wayback Machine.
9. Kusuma, G. P., Wigati, E. K., Utomo, Y., Suryapranata, L. K. P. Analysis of Gamification Models in Education Using MDA Framework. *Procedia Computer Science*, 2018;135: 385-92.
10. Iosup, A., Epema, D. An experience report on using gamification in technical higher education. Paper presented at the Proceedings of the 45th ACM technical symposium on Computer science education, 2014.
11. Rhamdani, A., Rhamdani, M. A., Amin, A. S. Writing a Literature Review Research Paper: A step-by-step approach. *International Journal of Basic and Applied Science*, 2014;3 (1): 47- 56.
12. Richter, G.; Raban, D.R.; Rafaeli, S. Studying Gamification: The Effect of Rewards and Incentives on Motivation. In *Gamification in Education and Business*; Springer: Cham, Switzerland, 2015; pp. 21–46.
13. Csikszentmihalyi, M. *Flow: The Psychology of Optimal Experience*. New York: Harper and Row. p. 15, 1990. ISBN 0-06-092043-2.
14. Werbach, K., Hunter, D. *For the win: How game thinking can revolutionize your business*. Philadelphia, PA: Wharton Digital Press; 2012.

15. Ryan, R.M., Deci, E.L. Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, 2000;25: 54-67.
16. Sonia Barghani Z. The Benefits of Gamification in Learning. 2020;6(2): 1671-75. IJARIE-ISSN(O)-2395-4396. Available from: http://ijarjie.com/AdminUploadPdf/The_Benefits_of_Gamification_in_Learning_ijarjie11788.pdf.
17. Gee, J. What video games have to teach us about learning and literacy. New York: Palgrave Macmillan; 2003.
18. Gibson, Ronald. Show gamification some love. Retrieved from <http://www.develop-online.net>, 2011.
19. Faria, A., Whiteley, T. An empirical evaluation of the pedagogical value of playing a simulation game in a principles of marketing course. *Developments in Business Simulation and Experiential Learning*, 1990;17: 53–57.
20. Domínguez, A., Saenz-de-Navarrete, J., de-Marcos, L., Fernández-Sanz, L., Pagés, C., Martínez-Herráiz, J. Gamifying learning experiences: Practical implications and outcomes. *Computers & Education*, 2013; 63: 380–92.
21. Anderson J, Rainie L. Gamification and the Internet: Experts Expect Game Layers to Expand in the Future, with Positive and Negative Results. *Games Health J*. 2012 Aug;1(4):299-302. doi: 10.1089/g4h.2012.0027. Epub 2012 Jun 25. PMID: 26191633.
22. Aldrich, C. Learning by doing: A comprehensive guide to simulations, computer games, and pedagogy in e-learning and other educational experiences. 1st Edition. Pfeiffer; 1st edition (May 5, 2005). ISBN-10: 0787977357.
23. Kumar, B., Khurana, P. Gamification in education-learn computer programming with fun. *International Journal of Computers and Distributed Systems*, 2012; 46–53.
24. Hakulinen, L., Auvinen, T., Korhonen, A. Empirical study on the effect of achievement badges in TRAKLA2 online learning environment. In *Proceedings of Learning and Teaching in Computing and Engineering (LaTiCE) Conference*, 2013; 47–54. doi: 10.1109/LaTiCE.2013.34.
25. Su, C., Cheng, C. A mobile gamification learning system for improving the learning motivation and achievements. *Journal of Computer Assisted Learning*, 2015;31(3):268–86.
26. Smith, A., Baker, L. Getting a clue: Creating student detectives and dragon slayers in your library. *Reference Services Review*, 2011;39 (4): 628–42.
27. Mayo MJ. Video games: a route to large-scale STEM education? *Science*. 2009 Jan 2;323(5910):79-82. doi: 10.1126/science.1166900. PMID: 19119223.
28. Sitzmann, T. A meta-analytic examination of the instructional effectiveness of computer-based simulation games. *Personnel Psychology*, 2011; 64:489–528.
29. Subhash, Sujit; Cudney, Elizabeth A. "Gamified learning in higher education: A systematic review of the literature". *Computers in Human Behavior*. 2018;87: 192–206. doi:10.1016/j.chb.2018.05.028.
30. Smiderle, R., Rigo, S.J., Marques, L.B. et al. The impact of gamification on students' learning, engagement and behavior based on their personality traits. *Smart Learn. Environ*. 2020;7:3. <https://doi.org/10.1186/s40561-019-0098-x>.
31. Errol Scott Rivera and Claire Louise Palmer Garden Gamification for student engagement: a framework. *Journal of Further and Higher Education*, 2021; 45(7): 999-1012. <https://doi.org/10.1080/0309877X.2021.1875201>.
32. Nevin C, Westfall A, Rodriguez M, Dempsey D, Cherrington A, Roy B, Patel M, Willig J. Gamification as a tool for enhancing graduate medical education. *Postgrad Med J*. 2014; 90(1070): 685–93.
33. Errol Scott Rivera, Claire Louise Palmer Garden. Impacts of gamification on intrinsic motivation. *Journal of Further and Higher Education* 45(4):1-14.

34. Sailer, M., Hense, J. U., Mayr, S. K., Mandl, H. How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction. *Computers in Human Behavior*, 2017;69, 371-80. <https://doi.org/10.1016/j.chb.2016.12.033>.
35. Motivation through Gamification. Available from: <https://seppo.io/site/assets/files/2292/motivatio-n-through-gamification-corporate.pdf>.
36. Shen, Ye and Joppe, Marion. "4 Gamification: Practices, Benefits and Challenges". *Gamification for Tourism*, edited by Feifei Xu and Dimitrios Buhalis, Bristol, Blue Ridge Summit: Channel View Publications, 2021, pp. 63-80. <https://doi.org/10.21832/9781845418236-006>.
37. Sabornido, Elna B. and Garma, Vernel A., Niepes, Gendolf L., Cabria, Florie May N.. Key Challenges and Barriers in Gamification: A Systematic Review (March 16, 2022). *Asia Pacific Journal of Advanced Education and Technology*, 1(1), pp.13- 19, 2022, Available at SSRN: <https://ssrn.com/abstract=4059193>.
37. Bai S, Hew KF, Gonda DE, Huang B, Liang X. Incorporating fantasy into gamification promotes student learning and quality of online interaction. *Int J Educ Technol High Educ*. 2022;19(1):29. doi: 10.1186/s41239-022-00335-9. Epub 2022 Jun 14. PMID: 35730028; PMCID: PMC9192135.
38. Kickmeier-Rust, M. D., Hillemann, E. C., Albert, D. Gamification and Smart, Competence-Centered Feedback: Promising Experiences in the Classroom. *International Journal of Serious Games*, 2014;1(1). <https://doi.org/10.17083/ijsg.v1i1.7>.
39. Chu, M., Fowler, T. A. Gamification of Formative Feedback in Language Arts and Mathematics Classrooms: Application of the Learning Error and Formative Feedback (LEAFF) Model. *International Journal of Game-Based Learning (IJGBL)*, 2020; 10(1): 1-18. <http://doi.org/10.4018/IJGBL.2020010101>.
40. Reiners, Torsten; Wood, Lincoln. *Gamification in Education and Business*. Switzerland: Springer International Publishing; 2015: 404: 414. ISBN 978-3-319-10208-5.
41. Kanthan R, Senger JL. The impact of specially designed digital games-based learning in undergraduate pathology and medical education. *Arch Pathol Lab Med*. 2011 Jan; 135(1):135-42.
42. Graafland M, Schraagen JM, Schijven MP. Systematic review of serious games for medical education and surgical skills training. *British journal of surgery*. 2012 Oct 1;33(10):1322-30.
43. Karagiorgas DN, Niemann S. Gamification and Game-Based Learning. *Journal of Educational Technology Systems*. 2017;45(4):499-519. doi:10.1177/0047239516665105.
44. Seidlein AH, Bettin H, Franikowski P, Salloch S. Gamified E-learning in medical terminology: the TERMIator tool. *BMC Med Educ*. 2020 Aug 28;20(1):284. doi: 10.1186/s12909-020-02204-3. PMID: 32859197; PMCID: PMC7456391.
45. Daniel Plevier, Merlijn Mac Gillavry Thomas van Tussenbroek, Abri Bharos, Tim Pelser Bent Engbers. *CupHunt: Gamification of Social Interaction*. CHI PLAY'19, October 22–25, 2019, Barcelona, Spain. DOI: 10.1145/3341215.3358241. Available from: file:///C:/Users/saeidim911/Downloads/CupHunt_Gamification_of_Social_Interaction.pdf.
46. Castelo, R. *Gaming Innovations in higher education*. IGI Global; 1st edition (July 13, 2017). ISBN-10: 1522529810.
47. Natalia Padilla-Zea, Daniel Burgos, Greg Holloway, Joseph Cullen. Social interaction and gamification with youth at risk of social exclusion: The technological approach of the Keystone project. *Entertainment Computing*, 2022; 43(1):100502. doi: 10.1016/j.entcom.2022.100502.
48. Dikcius V, Urbonavicius S, Adomaviciute K, Degutis M, Zimaitis I. Learning Marketing Online: The Role of Social Interactions and Gamification Rewards. *Journal of Marketing Education*. 2021;43(2):159-73. doi:10.1177/0273475320968252.

49. Barlett, C., Anderson, C., Swing, E. Video game effects Confirmed, suspected, and speculative: A review of evidence. *Simulation Gaming*, 2009; 40(3):377-403.
50. Cláuvín Almeida, Marcos Kalinowski, Bruno Feijó. A Systematic Mapping of Negative Effects of Gamification in Education/Learning Systems. 2021 47th Euromicro Conference on Software Engineering and Advanced Applications (SEAA). doi: 10.1109/SEAA53835.2021.00011.
51. Watbled, L., Pelayo, S., Guerlinger, S., Beuscart, R., Beuscart-Zéphir, M.-C. L'évaluation des nouvelles technologies en santé: un nouveau besoin, l'évaluation de l'adaptation à l'usage. *IRBM*, 2010; 31(1):36-40. <https://doi.org/10.1016/j.irbm.2009.11.006>.
52. Sami Hyrynsalmi, Jouni Smed, Kai Kimppa. The Dark Side of Gamification: An Overview of Negative Effects of Gamification in Education. *GamiFIN Conference 2017*, Pori, Finland, May 9-10, 2017.
53. Rodrigues, L., Pereira, F.D., Toda, AM. et al. Gamification suffers from the novelty effect but benefits from the familiarization effect: Findings from a longitudinal study. *Int J Educ Technol High Educ* 2022;19: 13. <https://doi.org/10.1186/s41239-021-00314-6>
54. van der Kooij K, van Dijsseldonk R, van Veen M, Steenbrink F, de Weerd C, Overvliet KE. Gamification as a Sustainable Source of Enjoyment during Balance and Gait Exercises. *Front Psychol*. 2019 Mar 1;10:294. doi: 10.3389/fpsyg.2019.00294. PMID: 30881322; PMCID: PMC6405433.
55. Dichev, C., Dicheva, D. Gamifying education: What is known, what is believed and what remains uncertain: a critical review. *International Journal of Educational Technology in Higher Education*, 2017;14(1): 9.
56. Huang, R., Ritzhaupt, A.D., Sommer, M. et al. The impact of gamification in educational settings on student learning outcomes: a meta-analysis. *Education Tech Research Dev* 2020;68: 1875–1901. <https://doi.org/10.1007/s11423-020-09807-z>.
57. Richard N. Landers, Diana R. Sanchez. Game-based, gamified, and gamefully designed assessments for employee selection: Definitions, distinctions, design, and validation. *Int J Sel Assess*. 2022;1–13. doi: 10.1111/ijsa.12376.
58. Lisette Guy. Gamified Assessments: A Literature Review, 2019. Available from: <https://www.testpartnership.com/factsheets/2019-gamification-literature-review.pdf>.
59. Piasecki, Stefan. Education, Pointsification", Empowerment? A critical view on the use of gamification in educational contexts. In: Ebner, Martin / Sad, Nihad (Ed.): *Handbook of Research on Digital Tools for Seamless Learning*, Hershey / PA: IGI Global (peer reviewed), S. 2017; 93-119.
60. Elna B. Sabornido, Vernel A. Garma, Gendolf L. Niepes, Florie May N. Cabria. Key Challenges and Barriers in Gamification: A Systematic Review. *Asia Pacific Journal of Advanced Education and Technolo*, 2022; 1(1): 13-20.
61. Toda, A.M., Valle, P.H.D., Isotani, S. (2018). The Dark Side of Gamification: An Overview of Negative Effects of Gamification in Education. In: Cristea, A., Bittencourt, I., Lima, F. (eds) *Higher Education for All. From Challenges to Novel Technology-Enhanced Solutions*. HEFA 2017. *Communications in Computer and Information Science*, vol 832. Springer, Cham. https://doi.org/10.1007/978-3-319-97934-2_9.
62. Sepandar Sepehr and Milena M. Head. Competition as an element of gamification for learning: an exploratory longitudinal investigation. *Proceedings of the First International Conference on Gameful Design, Research, and Applications*, 2013.
63. Congcong Yang and Hua Jonathan Ye and Yuanyue Feng. Using gamification elements for competitive crowdsourcing: exploring the underlying mechanism. *Behaviour and Information Technology*, 2021;40: 837-54.
64. Burguillo, J. C. "Using game theory and Competition-based learning to stimulate student motivation and performance". *Computers & Education*, 2010; 55 (2): 566–75.

65. Van Grove, Jennifer. "Gamification: How Competition Is Reinventing Business, Marketing & Everyday Life". Mashable. Archived from the original on 3 August 2017. Retrieved 12 February 2013.
66. Menezes, C. and Bortolli, R. Potential of Gamification as Assessment Tool. *Creative Education*, 2016; 7: 561-66. doi: 10.4236/ce.2016.74058.
67. Sabornido, Elna B. and Garma, Vernel A. and Niepes, Gendolf L. and Cabria, Florie May N., Key Challenges and Barriers in Gamification: A Systematic Review (March 16, 2022). *Asia Pacific Journal of Advanced Education and Technology*, 1(1), pp.13- 19, 2022, Available at SSRN: <https://ssrn.com/abstract=4059193>
68. Muhammad Dafit Pitoyo, Sumardi Sumardi, Abdul Asib. Gamification-Based Assessment: The Washback Effect of Quizizz on Students' Learning in Higher Education. *International Journal of language Education*, 2020; 4: 1-10.
69. Mageswaran Sanmugam, Hasnah Mohamed. Gamification; Challenges to Transcend Beyond Online Education into the 21st Century Classroom. *Journal of Education and Social Sciences*, 2017; 8(1): 244-50.
70. Muhammad Dafit Pitoyo. Web-Based Gamification: Problems in EFL Classroom of Higher Education Due to Online Assessment Employment. *International Summit on Science Technology and Humanity (ISETH 2018). Integrating Knowledge for Future Sustainable Development. International Summit on Science Technology and Humanity*, 2018; 118-24.
71. Putz, Lisa-maria and Treiblmaier, Horst, Increasing Knowledge Retention through Gamified Workshops: Findings from a Longitudinal Study and Identification of Moderating Variables (January 21, 2019). *Proceedings of the 52nd Hawaii International Conference on System Sciences (2019)*; ISBN: 978-0-9981331-2-6. Available at SSRN: <https://ssrn.com/abstract=3319857>.
72. Brull S, Finlayson S. Importance of Gamification in Increasing Learning. *J Contin Educ Nurs*. 2016 Aug 1;47(8):372-5. doi: 10.3928/00220124-20160715-09. PMID: 27467313.
73. Ayelet Gal-Oz, Oren Zuckerman. Embracing Cheating in Gamified Fitness Applications. *roceedings of the 2015 Annual Symposium on Computer-Human Interaction in Play*, 2015.
74. Khan, Z.R., Dyer, J., Bjelobaba, S. et al. Initiating count down - gamification of academic integrity. *Int J Educ Integr*, 2021; 17(6):2-15. <https://doi.org/10.1007/s40979-020-00068-0>.
75. Terry L. Gamification Done Right—The Do's and Don'ts. Available from: <https://hospitalitytech.com/dos-and-donts-gamification>.
76. Abu Dhabi Education Guide. First ever gamified moral education programme successfully trialled in UAE schools. *Cyber Gear Venture*, 2019. <https://abudhabieduguide.com/first-ever-gamified-moral-education-programme-successfully-trialleduae-schools/> [accessed 25 May 2020].
77. Blackburn, J., Simha, R., Kourtellis, N., Zuo, X., Ripeanu, M., Skvoretz, J., et al. Branded with a scarlet C: Cheaters in a gaming social network. In *Proc. WWW 2012*, ACM Press, 2012; 81-90.
78. Hee Yoon Kwon, Koray Özpolat. The Dark Side of Narrow Gamification: Negative Impact of Assessment Gamification on Student Perceptions and Content Knowledge. *INFORMS Transactions on Education*, 2021; 21(2):67-81.
79. Ahmed Karam Yousof. Benefits and Disadvantages of Utilizing Gamified Learning in Higher Education: A Systematic Analysis. *Handbook of Research on Adult Learning in Higher Education*, 2020.
80. Alabbasi, D. Exploring graduate students' perspectives towards using gamification techniques in online learning. *Turkish Online Journal of Distance Education*, 2017; 18(3):180. <https://doi.org/10.17718/tojde.328951>.
81. Barna, B., Fodor, S. An empirical study on the use of gamification on IT courses at higher education. In M. E. Auer, D. Guralnick, & I.

Simonics (Eds.), *Teaching and Learning in a Digital World*, 2018; 715: 684–92. Springer International Publishing. https://doi.org/10.1007/978-3-319-73210-7_8.

83. Erenli, K. Gamification and Law. In: Reiners, T., Wood, L. (eds) *Gamification in Education and Business*. Springer, Cham, 2015. https://doi.org/10.1007/978-3-319-10208-5_27.

84. Thorpe, A.S., Roper, S. The Ethics of Gamification in a Marketing Context. *J Bus Ethics*, 2019; 155: 597–609. <https://doi.org/10.1007/s10551-017-3501-y>.

85. Tierney, James, *Investment Games*. *Duke Law Journal*, forthcoming, 2022; vol. 72, Available at

82. Janaki Kumar, Mario Herger. Chapter 8: Legal and Ethical Considerations. Available from:

<https://pressbooks.nsc.ca/evolvingpr/chapter/chapter-8-ethical-and-legal-copnsiderations/>.

SSRN: <https://ssrn.com/abstract=3916407> or <http://dx.doi.org/10.2139/ssrn.3916407>.

86. Filomena Faiella Maria Ricciardi. Gamification and learning: A review of issues and research. *Journal of e-Learning and Knowledge Society*, 2015; 11(3):13-21. doi: 10.20368/1971-8829/1072.

87. Roman Dremluga, Olga Dremluga, Andrei Iakovenko. Virtual Reality: General Issues of Legal Regulation. *Journal of Politics and Law*, 2020; 13(1):75. doi: 10.5539/jpl.v13n1p75.