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Gamification in Education Context:
The Intention, The Design, and The Result

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Abstract— Gamification has been widely adopted in many areas, including in the educational context. The students need to be motivated in following the learning process because everyone feels happy to learn if there is no coercion. By presenting something fun and enjoyable, students are expected to be more involved in the learning process, which will achieve better learning outcomes. Gamification is very reliable in bringing fun and pleasure to the learning process for the students. We analyze three items from the previous study; the intention and what the goals are expected, how to design, and the result of gamification in the education context. We found the intentions of gamification adoption in an educational context. They are to increase students' motivation to learn and present an alternative learning method that is more fun and enjoyable. And for the success of this gamification program, a game application can be developed using existing sophisticated technology and by presenting a reward system mechanism. The presence of points, badges, and leader boards cannot be separated from the gamification because it is a very inherent gamification feature to motivate students to play the game. Getting students to use the games intensively is not the only result we expect, but it also makes students learn better to produce good learning outcomes.

Keywords— Gamification, Education Context, Game, Learning.

I. INTRODUCTION

Games have become a standard part of social life nowadays [1]. The games could come in the form of an electronic game or video game on many platforms, such as console, PC, and mobile. People who play games have many kinds of motivation. But in general, people who play games seek pleasure as part of their stress relief [2, 3, 4, 5]. Games are something that can be relied on when people need entertainment.

Developers developed games in which the goal is fun to play by presenting challenges for the gamers [6]. In the gaming context, these challenges must be positive challenges that make gamers perceive pleasure when the gamers feel that they can apply their skills [7, 8]. Therefore, the presented challenges should meet the balance between their difficulty and the gamers' skill to not feel bored, anxious, or even apathetic [9]. Furthermore, the challenge shouldn't be too easy or too challenging to tackle. Due to the challenges presented in the game, games have a significant potential to be adopted as educational media [10] since the gamers are allowed to learn and develop abilities, skills, and strategies.

The game itself is defined as "a system in which players engage in an artificial conflict that is defined by rules and results in quantifiable outcome" [11]. But the application that deliberately added game elements in it, even though it is not a game, is called gamification [12]. There are multiple definitions of gamification. One of the most straightforward definitions of gamification is "The use of game elements and game-design techniques in non-game contexts" [13]. Others also defined gamification as a process, not only the use of the final result [14, 15]. Gamification is considered as a process to make activities or services as a game.

People have been adopted gamification in many field areas, such as education, health management, tourism, environment, finance, transportation, enterprise systems, and many more. However, for the people to adopt the game element in those non-gaming context field areas, it must have the intention and such method to establish the game to achieve the goal.

Gamification in the education context is adopted to support the learning process. But gamification is not the primary goal itself to be achieved but to support the learning process. In specific circumstances, gamification is needed to motivate the students or educational participants. This circumstance is understandable because humans basically feel happy to learn something if they don't feel forced, either by the tutors, by the systems, or by anything. [16, 17]. Therefore, by adding a game element to the learning process, it is expected that students can find fun and pleasure in it so that they feel that learning is enjoyable and not a compulsion.

Furthermore, gamification is not adopted to change the learning process that occurs only but also to change the behavior of learning participants and to improve the learning outcomes themselves. For many occasions in which teaching methodologies could be tedious, games emerge as an alternative solution to provide a better experience in the learning process for the students [18]. Moreover, children show their joy in performing some tasks through games [19]. Thus, it can be said that gamification is very reliable in bringing fun and pleasure to the learning process for the students.

This study analyzes the intention and goal in gamification adoption, also how to design the game, and the gamification results. We will take these three things from five examples of the adoption of gamification reported in previously published papers. Examples of cases presented consist of gamification in

lower education, namely for children aged 8-12 years, and gamification for higher education, namely education in universities. We continue to present a discussion section to give some findings related to this topic that might contribute to implications on research and practice. Our contribution might also be adopted by teachers or educators who need to consider whether they should adopt gamification or not and developers who get input on developing the gamification tools.

II. RESEARCH METHODOLOGY

This study focuses on gamification in the education context. There are three most essential things in applying gamification: the intention to adopt gamification, how to design the gamification, and the results after gamification. To analyze these three questions, we search for papers published in the last five years that report their study of gamification in education. We found five papers reporting the study of gamification in education. The papers as listed in Table I below. The research was also carried out on various paper topics: games, game design, education, gamification, to increase knowledge and more profound understanding.

III. FINDINGS AND DISCUSSION

This section will present the evaluation results of the five previous study examples. The section is divided into three subsections: the intention to adopt gamification, the gamification design, and the results of the gamification.

A. The Intention to Adopt Gamification

Successful education must involve all the stakeholders, including the students or the educational participants. But at a certain point, the learning participants or the students might not feel motivated. And when that motivation is not there, the learning process will not be optimal, and learning outcomes cannot be achieved. The education provider must make efforts to increase the interest in learning again. Education providers must always maintain the student's motivation, which is challenging in education [24]. There must be something that can attract students' interest in learning again.

Gamification is a potential strategy to enhance the dropping motivation level of the education system participants [26, 27, 28, 29, 30]. By adopting this gamification, it is expected that the learning behavior of the learner could change for the better. And after that, the changes in the learning behavior should positively impact the learning outcome.

Next following part of this section will be presented five examples of gamification adoption in the education context. These examples were reported successfully implemented and made a positive impact on enhancing learning motivation or learning outcome.

- This first example of gamification in the education context comes from Spain, as its report was available in 2016 [20]. The situation faced in this case is the condition of children aged 8-12 who experience the threat of obesity due to a destructive lifestyle. Then, gamification is adopted to educate and motivate children to learn about the dangers of obesity and a healthy lifestyle.

- The second example occurs in a university in Spain, which is reported in 2019 [21]. It is an experimental study for higher education students to provide the students to enhance their learning motivation and enriched the learning experience by adopting a pervasive game that allowed students to experience the learning process beyond the close-space.

- The third example is also for higher education students that have been reported in 2020 [22]. This study is motivated by the need to find complementary learning strategies in face-to-face learning that can increase students' motivation and engagement with the learning process.

- The fourth example comes in engineering programs in a university in Mexico. The gamification is adopted for operation research course that usually perceived as a complex and challenging subject by the students. Gamification is adopted to help reduce students' fear of

TABLE I
PREVIOUS STUDY OF GAMIFICATION ADOPTION IN EDUCATION CONTEXT

Author (Year of Publication)	Topic	Game Mechanic
Gonzalez, et. al. (2016) [20]	Gamification for children aged 8-12 that provides education to children about a healthy lifestyle	The research team developed a game application called TANGO: H, which can be played in single-player or multiplayer mode. This game provides various challenges that require physical movement, which are divided into several levels. The player will get a reward every time he completes a physical challenge.
Arango-Lópeza, et. al. (2019) [21]	Gamification in higher education using pervasive game	In this study, the team developed a geolocation-based pervasive game application called CREANDO. Users are required to collect several lines of program code so that it can be compiled into a complete program. By utilizing Augmented Reality technology, users collect snippets of the program code that are located in several locations, even those located outside the campus.
Aguiar-Castillo, et. al. (2020) [22]	Gamification in higher education with social content	This research involves a web-based application called HEgameApp. This game invites its users to contribute to each other by uploading various learning resources such as news, articles, videos, etc. Other users will rate the contribution, and the source uploader will receive a reward
Díaz-Ramírez (2020) [23]	Gamification in higher education of engineering program	The games developed in this study offers rewards beyond just points and badges. The reward is beneficial for users to compromise poor scores on quizzes and exams, set a schedule, or choose team members. In addition, the game provides various tasks that the user in several levels must do. And the tasks performed by the user will be validated by the instructor in the class.
Aini, et. al. (2021) [24]	Gamification in higher education of Kampus Merdeka Program in Indonesia	The game made is web-based. Users will be given daily quests that can be done to earn a certain amount of points. There is a leaderboard based on points earned by each user on a daily, weekly and monthly basis to determine who is entitled to a reward in the form of bagde

not passing this course by presenting something fun and bringing a positive attitude toward this course [23].

- This last example is based on concerns that the learning process applied by the one-way lecture method will be less attractive. Gamification was adopted to create a feeling of fun and not boring for students to become more motivated to join the *Kampus Merdeka* program [24].

Based on the examples above, we could highlight that gamification adoption intends to increase students' motivation and engagement in the learning process. And also to provide a better experience for students to follow the learning process. These intentions are aligned with the previous literature. And when all that intention is fulfilled, a better learning outcome is the final goal we can achieve. However, we should emphasize that gamification is adopted to support the learning process. Gamification is not the primary goal itself to be achieved but only to supplement the learning process.

The intention in gamification adoption for education context could vary compared to other contexts. For example, gamification in the tourism context might have the intention to increase brand awareness and customer loyalty to the destination [31]. Likewise, gamification for e-commerce applications could be adopted to affect customer's purchase and electronic word-of-mouth (eWOM) sharing behavior [32].

B. The Gamification Design

Referring to the definitions of gamification, it is known that gamification consists of 2 things, they are the game itself and the non-gaming context. That means that people who plan to build a gamification tool must pay attention to these two things. The tool might attract user's intention to use and be fun to play. On the other hand, the tool might answer the user's needs, which motivated the initial development of the gamification tool.

This section will review five previous examples of how the gamification tool was designed and developed. The first example is the gamification with children aged 8-12 as the target. And the rest are gamification in higher education.

- The first example of gamification to educate children about obesity and a healthy lifestyle adopted a game application using a motion sensor. The idea is to get the children to participate in physical activity. This learning material was then delivered through various physical activities that use motion sensor technology. Game applications made using the motion sensor are, of course, possible to be designed in this way, a game that requires physical movement and gestures from the players. At the same time, the game content itself is about knowledge of healthy foods and lifestyles [20]. Students could play the game in single-player mode as well as multiplayer mode. The game application is not the only method adopted in this study. The study also combines other activities supervised by education professionals and even parents, such as playing traditional motor games. Points, badges, and

leaderboards (PBL) are also provided to motivate the children to get involved with the programs.

- The example of gamification in higher education in Spain develops an application that employs augmented reality and geolocation pervasive games. The developers take advantage of the sophisticated technology. The idea is to make students collect any lines of code snippets according to the scenario given. Students might hunt for the line of codes outside the classroom using their smartphones. A back-end application provides and pushes the scenarios to the mobile apps installed in students' smartphones. These collected lines of code are useful for compiling and executing a computer program [21]. This method can provide a new refreshment for students so that they are not bored of continuously studying in the classroom.

- The third gamification example in higher education also adopts a game application. The application includes one crucial game element that is connecting with other people. The idea is to share knowledge among the students, and the peer will evaluate the content shared. Some leaderboards and badges are employed in the application as a form of reward. This reward system is necessary to motivate the students to use this application [22].

- The fourth gamification example lasts for 16 weeks of regular lectures. The game also adopts a point, badge, and leaderboard as the reward for participants who can complete the challenge given in the game. Students can trade any badges they collected for their benefits, such as compromising their actual score in quizzes and exams, choosing a partner in a group project, etc. [23].

- Gamification is done using a website-based application. The main idea is to share a certain number of daily quests. Thus, giving rewards in the form of points and badges and displaying a ranking board based on daily, weekly and monthly points [24]. By showing the achievement in the leaderboard regularly on a daily, weekly, and monthly basis, it is hoped that this method can spur students to be the best in doing the given quest.

There are differences in game design from the five examples above. But all of the five examples used some points, badges, and leaderboards mechanical as the reward system to encourage users' intention to use the application. However, points, badges, and leaderboards, or commonly abbreviated as PBL, are indeed characteristics that will always exist in a gamification application [13].

When we talk about people's motivation to play games, there are three reasons categories why people play games: individual gratification, social gratification, content-related gratification [33]. And those badges or leaderboards are a common form of content-related gratification. A reward system could be considered as an extrinsic motivation for the players to play the game [34]. Nevertheless, the developer should not reward excessively using a badge or leaderboard elements. Just use the reward system appropriately. When the

intrinsic motivation (challenges, enjoyment, etc.) has been increased, the reward system is suggested to be minimized by the developers [26].

It is interesting to see the study results in New Zealand that compared two groups of children aged 9-10 years. This study concludes that the application used in gamification, which is enriched with many fun features, can increase students' engagement in the learning process [35]. But let's look at the examples of gamification above at the higher education level. It seems that students are more interested in the benefits offered and not just fun features, such as the pride that comes when appearing on the leaderboard, the opportunity to compromise a poor test score, etc.

The tools employed in the gamification adoption above use existing sophisticated technology. But keep in mind that gamification is not about how to master the game tools. So, technology should not actually make users find it challenging to use it. Instead, the technology employed must support the achievement of the goals of this gamification adoption. Therefore, the developers should consider the application's design to bring an excellent experience to its users. Developers must design the game in such a way that students do not see mistakes made as fear but rather see it as an opportunity to learn [36].

C. The Result of Gamification Adoption

This section addresses the result from the five previous studies of gamification implementation in the education context. The result is extracted from the earlier papers reported as follow:

- As reported in the first study, the authors stated that gamification programs' main goals in lower education are not to reduce the BMI of the children but to convert children's unhealthy behavior to a healthy lifestyle by introducing daily physical activity. Therefore, the improvement in children's BMI is considered a consequence of improved children's healthy lifestyles. The game application itself has been the primary motivation for the children to join the program as the game was found to be fun and enjoyable. The game was found to be fun for children, mainly because it is equipped with a reward system using points, badges, and a leaderboard [20].
- The second study of gamification implementation reports that using a pervasive gaming experience has successfully increased the student motivation to engage with the game. By surveying the students, the experiment described in this paper reported that the presence of gamification increased students' motivation to participate in the learning process. And engaging more with game apps brings a positive impact to the learning process of the students. Students' knowledge has increased by 30% after the gaming experience [21].
- The third study in higher education has reported that the student might be unaware of the benefit of the game application that could bring progress in their learning process as long as the game is fun and playable. The study also found that the students expect social and hedonic benefits without compromising privacy or data security [22]. As this game application is designed for face-to-face learning, students tend to expect to be recognized by their peers when they share something using the application.
- The fourth study has emphasized a difference between the student who actively played the game and who does not actively play the game. The student who actively played the game got a better passing rate and perceived that the learning process was going better because of the game's contribution [23]. These active students perceive that the game's design helps them improve their learning, even though the main reason they play this game is the extrinsic rewards they could get. Those who were not actively playing in the game have two main reasons; their lack of time and distrust of the game's advantages.
- The evaluation of the application of gamification involved 200 students participating in the Kampus Merdeka program. In this study, it was reported by the authors that students felt very motivated to join the Kampus Merdeka program [24]. But unfortunately, the authors cannot provide the final learning outcome whether there is an increase compared to if not using gamification.

All five studies above reported that the gamification program had been successfully implemented. Succeed in making students want to be involved in the gamification program and succeed in increasing grades or learning outcomes. The students like and enjoy the presented games, which causes success in the gamification program. Previous studies have also proven that the teaching method that the teaching delivered uses gamification raises the lower education students' motivation [37].

Increasing student motivation or student engagement in the learning process differs from learning outcomes. The learning outcomes could relate to the quality of the learning process, but the process and the outcomes are not always directly proportional. Previous research reported that the gamification program in lower education makes the learning process fun and motivating, and in the end, increases the level of students' learning [38, 39]. On the other hand, the adoption of gamification in higher education is reported to be unsuccessful in improving learning outcomes marked by the achievement of lower scores than the group of students who used conventional learning methods [40, 41].

Those studies indicated that the failure was due to the game design of the presented gamification. This means that the game's design influences the success of gamification significantly. It is aligned with the result reported that game design elements are very crucial [42].

Another study of perceived benefits of gamification confirms that age has a negative correlation with ease-of-use on gamification [43]. Any user group at any age could adopt gamification easily without any difficulties. These users

actually find it easy to follow the processes in gamification. However, to gain success in the adoption of gamification in the education context, the characteristics of its users must be considered [44]. The system must comply with the student's preferences and needs. As a summary of the above analysis, it can be seen in Table II.

TABLE II
SUMMARY OF GAMIFICATION IN EDUCATION CONTEXT

Items	Lower Education Level	Higher Education Level
Intention	to increase students' motivation and engagement in the learning process	to increase students' motivation and engagement in the learning process
Design	Gamification should utilize a game application that is enriched by fun features and also by adopting a PBL reward system	PBL reward system must be applied along with other benefits that the students well acknowledge
Result	The fun and enjoyment presented in gamification have become the main attraction for students to join the program. Student learning outcomes are well achieved.	Students who are aware of the benefits offered in this gamification program become more active in playing and motivated in the learning process. Those who are actively involved in the gamification program get better grades.

IV. CONCLUSION

Gamification is defined as a process to use game elements and game mechanics in a non-gaming context. Education is one of these non-gaming contexts besides health, tourism, finance, transportation, enterprise system, and many more.

In this paper, we have presented the extraction of five previous studies about gamification in the education context. The extraction includes three things; the intention of gamification adoption, how they design the gamification, and the result of the adoption of gamification.

We might adopt a game to motivate the student and encourage students to engage more in the learning process. The teachers or education facilitators might consider the game as a complementary tool in the teaching method.

The gamification tool must effectively increase student motivation in the learning process and be efficient to develop at a low cost [19]. The developers could employ the game development framework that is already available. Points, badges, and leaderboards are the most characteristic of gamification as the reward system.

The important thing is that the learning content must be made in an "interesting" way. And to make this happen, developers can take advantage of the existing sophisticated technology, such as motion sensors, augmented reality, or any technology we could found in many smartphones. But keep in mind that technology does not mean that it has to diminish the essence of ease-of-use of the gamified system.

Developers should not only focus on designing a game that can attract people to play it. But we need to emphasize that there is the original purpose why the developers should develop the game. The non-gaming context must be the main focus, not the game itself. The students must acknowledge and get the benefits marked by better learning outcomes compared when using conventional learning methods without gamification. A better gamification design focused on user needs, and characteristics could provide better results for students to gain learning outcomes.

For future work, gamification could be explored more about the most suitable game genre for certain conditions. One specific genre might appeal to children but might not apply to higher education students. The adjustments to the design of this game may also include how to give rewards in it. For example, what kind of badge could we deliver that is relevant to a particular education level? By developing games that match the interests and comply with the characteristics of educational participants, the goal of implementing gamification in the education context will be easier to be achieved.

REFERENCE

[1] F. Gómez-Gonzalvo, P. Molina and J. Devís-Devís, "Which are the patterns of video game use in Spanish school adolescents?", Entertainment Computing 34, 2020.

[2] J. Bae, D. M. Koo and P. Mattila, "Affective motives to play online games", Journal of Global Scholars of Marketing Science 26 (2), pp. 174-184, 2006.

[3] C. Chen, "Playing mobile games for stress recovery purposes: A survey of Chinese adolescents" Telematics and Informatics 56, 2020.

[4] E. Collins and A. L. Cox, "Switch on to games: Can digital games aid post-work recovery?", Int. J. Human-Computer Studies 72, pp. 654-662, 2014.

[5] L. Reinecke, "Games and recovery: the use of video and computer games to recuperate from stress and strain", Journal of Media Psychology Theories Methods and Applications 21 (3), pp. 126-142, 2009.

[6] R. Bernhaupt, *Game User Experience Evaluation* (Springer International Publishing, Switzerland, 2015

[7] J. A. Ghani and S. P. Deshpande, Task Characteristics and the Experience of Optimal Flow in Human-Computer Interaction", The Journal of Psychology 4, pp. 128, 1994.

[8] D. L. Hoffman and T. P. Novak, "Flow Online: Lessons Learned and Future Prospects", Journal of Interactive Marketing 23(1), pp. 23-34, 2009.

[9] T. Zhou, "Understanding the effect of flow on user adoption of mobile games" Personal and Ubiquitous Computing 17(4), pp. 741-748, April 2013.

[10] B. G. Salvat and J. Aguayos, *Pantallas, juegos y educación: La alfabetización digital en la escuela*, Desclée de Brouwer, Bilbao- Spain, 2004.

[11] K. Salen and E. Zimmerman, *Rules of Play: Game Design Fundamentals*, MIT Press, London, 2004.

[12] K. Robson, K. Plangger, J. H. Kietzmann, I. McCarthy and L. Pitt, "Is it all a game? Understanding the principles of gamification", Business Horizons 58 (4), pp. 411-420, 2015.

[13] K. Werbach and D. Hunter, *For the win: how game thinking can revolutionize your business*, Wharton Digital Press, Philadelphia, October 2012.

[14] K. Werbach, "(Re)Defining Gamification: A Process Approach", in Spagnolli A., Chittaro L., Gamberini L. (eds) Persuasive Technology. PERSUASIVE 2014. LNCS 8462, 2014.

[15] K. Huotari and J. Hamari, "A definition for gamification: anchoring gamification in the service marketing literature", Electron Markets 27, pp. 21–31, 2017.

[16] C. Tüysüz, "Effect of the computer based game on pre-service teachers' achievement, attitudes, metacognition and motivation in

chemistry", Scientific Research and Essay 4(8), pp. 780-790, August 2009.

[17] M. Prensky, "Digital game-based learning Computers", in Entertainment (CIE) 1(1), pp. 21, 2003.

[18] G. Surendeleg, V. Murwa, H. K. Yun and Y. S. Kim, "The Role of Gamification in Education – A Literature Review Contemporary", Engineering Science 7 (29), pp. 1609-1616, January 2014.

[19] C. Stach and L. F. M. Schlindwein, "Candy Castle — A prototype for pervasive health games" in *IEEE International Conference on Pervasive Computing and Communications Workshops,* March 2012.

[20] C. S. Gonzalez, N. Gomez, V. Navarro, M. Cairos, C. Quirce, P. Toledo and N. Marrero-Gordillo, "Learning healthy lifestyles through active videogames, motor games and the gamification of educational activities", Computers in Human Behavior 55, pp. 529-551, February 2016.

[21] J. Arango-Lópeza, C. C. C. Valdiviesoa, C. A. Collazosa, F. L. G. Velab and F. Moreirac, "CREANDO: Tool for creating pervasive games to increase the learning motivation in higher education students", Telematics and Informatics 38, pp. 62-73, 2019.

[22] L. Aguiar-Castillo, L. H. Lopez, P. D. Saa-Perez and R. Perez-Jimenez, "Gamification as a motivation strategy for higher education students in tourism face-to-face learning", Journal of Hospitality, Leisure, Sport & Tourism Education 27, 2020.

[23] J. Díaz-Ramírez, "Gamification in engineering education – An empirical assessment on learning and game performance", Heliyon 6, 2020

[24] C. Dichev and D. Dicheva, "Gamifying Education: What is Known, What is Believed and What Remains Uncertain: a Critical Review", International Journal of Education Technology in High Education 14 (9), pp. 80-100, 2017.

[25] Q. Aini, M. Budiarto, P. O. H. Putra, and N.P.L. Santoso, "Gamification-based The Kampus Merdeka Learning in 4.0 Era", Indonesia Journal of Computing and Cybernatics Systems, Vol. 15 (1), pp. 31-42, January 2021.

[26] M. R. Lepper, J. H. Corpus and S. S. Iyengar, "Intrinsic and Extrinsic Motivational Orientations in the Classroom: Age Differences and Academic Correlates", Journal of Educational Psychology 97(2), pp. 184–196, 2005.

[27] Y. Pan and M. Gauvain, "The Continuity of College Students' Autonomous Learning Motivation and Its Predictors: A Three-year Longitudinal Study", Learning and Individual Differences 22(1), pp. 92-99, 2012.

[28] V. Busse, and C. Walter, "Foreign Language Learning Motivation in Higher Education: A Longitudinal Study of Motivational Changes and Their Causes", Modern Language Journal 97 (2), pp. 435-456, May 2013.

[29] A. Darby, B. Longmire-Avital, J. Chenault and M. Haglund, "Students' Motivation in Academic Service-Learning Over the Course of the Semester", College Student Journal 47 (1), pp. 185–191, March 2013.

[30] D. Ramirez and K. Squire, "Gamification and Learning" In S. Walz & S. Deterding (Eds.), *The gameful world: Approaches, issues, applications* (M.A: The MIT Press, Cambridge, 2015) pp. 629-652.

[31] F. Xu, D. Buhalis and J. Weber, "Serious games and the gamification of tourism", Tourism Management 60, pp. 244-256, June 2017.

[32] M. F. Al-Zyoud, "The impact of gamification on consumer loyalty, electronic word-of mouth sharing and purchase behavior", Journal of Public Affairs 20(3), pp. 1-9, August 2020.

[33] M. Scharkow, R. Festl, J. Vogelgesang and T. Quandt, "Beyond the 'core-gamer': Genre preferences and gratifications in computer games", Computers in Human Behavior 44, pp. 293–298, March 2015.

[34] L. Marcos, A. Dominguez, J. S. Navarrete and C. Pages, "An empirical study comparing gamification and social networking on e-learning", Computer and Education 75, pp. 82-91, 2014.

[35] K. Nand, N. Baghaei, J. Casey, B. Barmada, F. Mehdipour and H. N. Liang, "Engaging children with educational content via Gamification", Smart Learning Environments, 6 (6), 2019. https://doi.org/10.1186/s40561-019-0085-2

[36] J. J. Lee and J. Hammer, "Gamification in Education: What, How, Why Bother?", Academic Exchange Quarterly, Vol. 15 (2), January, 2011.

[37] G. Y. Hong and M. Masood, "Effects of Gamiification on Lower Secondary School Student' Motivation and Engagement", World Academy of Science, Engineering and Technology, International Journal of Educational and Pedagogical Sciences, Vol. 1, pp. 3757-3764

[38] C. Cheong, F. Cheong and J. Filippou, "Quick quiz: A gamified approach for enhancing learning", in *17th Pacific Asia Conference on Information Systems*, 2013.

[39] J. Simões, R. D. Redondo and A. F. Vilas, "A social gamification framework for a K-6 learning platform", Computers in Human Behavior 29(2), pp. 345–353, 2013.

[40] A. Domínguez, J. Saenz-de-Navarrete, L De-Marcos, L. Fernández-Sanz, C Pagés and J. J. Martínez-Herráiz, "Gamifying learning experiences: Practical implications and outcomes" Computers & Education 63, pp. 380–392, 2013.

[41] M. D. Hanus and J. Fox, "Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance", Computers & Education 80, pp. 152–161, 2015.

[42] M. Sailer, J. Ulrich Hense, S. Katharina Mayr, and H. Mandl, "How Gamification Motivates: An Experimental Study of The Effects of Specific Game Design Elements On Psychological Need Satisfaction", Computer in Human Behaviuor, Vol. 69, pp. 371-380, 2017.

[43] J. Koivisto and J. Hamari, "Demographic differences in perceived benefits from gamification" Computers in Human Behavior 35, pp. 179–188, 2014.

[44] R. van Roy and B. Zaman, "Why Gamification Fails in Education and How to Make it Successful: Introducing Nine Gamification Heuristics Based on Self-Determination Theory" In: Ma M., Oikonomou A. (eds) *Serious Games and Edutainment Applications*, vol. 2. (Springer International Publishing AG, Chan-Switzerland, 2017) pp. 485-509.