

Embedding Gamification Approach in Education

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Abstract : The process of memorizing too many terminologies and technical facts for most of courses can be difficult for students and lecturers as it requires students to recognize and comprehend the concepts very well. It has become a big challenge for both students and lecturers to achieve the same learning outcomes of the courses as different students have different learning styles and preferences. Hence, this chapter is written purposely to reviews the previous studies in exploring the current teaching and learning practices that embraced the gamification approach in education. This chapter also discovered the features of gamification to be considered by the lecturers for ensuring the gamified activities and products designed are suitable to be used in educational environment. Also discussed and explored in this chapter are the advantages of embedding gamification elements in teaching and learning environment.

INTRODUCTION

Using games to support learning process is not a new approach whether online or offline based. Kiryakova et al. (2014) summarized that gamification is the integration of game elements and game thinking in activities that are not games. Nah et al. (2013) highlighted the benefits of gamification obtainable by students such as improving motivation for students to learn more, allowing repeated failures which permit students to learn new things and tolerating behavioural change as the students experience learning process in variety of environments and settings offered by gamification. By applying some features those included in a gaming application such as user, challenges / tasks, points, levels, badges, ranking, a new model can be developed to make the teaching and learning more fun and engaging. Positive and rapid feedbacks in gamification also help student gain motivation to study and stimulate positive and entertaining learning process (Muntean, 2011). Nowadays, the advancement of technologies gives big

opportunity to institutions to produce high quality educational games that can be used to improve students' understanding in the subject matter yet entertaining at the same time. A study by Bajko et al. (2015) that using quantitative data revealed that most of students were not only engaged when using gamification elements in their curriculum course, surprisingly also willing to do extra preparation for the course although the students' performance is still unmeasured.

GAMIFICATION IN EDUCATION

Most of the time, students find it difficult to learn new course with a lot of terminologies to be comprehended and memorized. They always confront unfamiliar technical terms and are required to memorize and visualize certain processes such as what happen in the computer's memory (Khaleel et al., 2015) in computer science course. Weak students feel a burden and end up memorizing the processes without understanding the terms and the process involved. This situation indirectly leads students to get low grades in the course. There are suggestions by some researchers to adopt an enjoyable approach in learning difficult subjects. Thus, studies have shown the application of gamification elements in websites do engaged users. A study by Laskaris (2015) concluded that students can remember 90% of the content if they involving or participating in the gamified educational materials or simulation, but they only can recall 10% of wen only reading, 20% when listening, 30% with visualized oral presentation, and 50% by observing someone explaining the content with some actions. It was also supported by a study conducted by Khaleel et al. (2015) in applying gamification features in programming language course as a new architecture of gamification application to increase the effectiveness of learning and enhance students' understanding.

Gamification is defined as the process of adding games or game like elements to something, such as a task, to encourage participation. In other words, gamification is the application of game-based elements to non-game systems (Wood et al., 2013). Gamification builds on established game-based approaches and an understanding of the nature of humankind, founded on behavioral economics and psychology, to allow system designers to achieve objectives. Gamification is applied in various disciplines to promote and

encourage certain behaviours (Wood & Reiners, 2015). Hence, gamification is not about turning routine activities into a game but to redesign work processes with game mechanisms for a fun and enjoyable experience. Before we discuss about the roles of gamification in learning activities, it is necessary for us to identify the meaning of authentic learners as they would be involved in the gamified learning system. For authentic learning to occur, learners must be engaged in an inventive and realistic task that provides opportunities for complex collaborative activities. Herrington, Reeves, and Oliver (2010) defined authentic learning as providing an alternative approach that allows for an engaging and student-centered learning design. In authentic learning contexts, technology is used as a cognitive tool for problem solving and knowledge construction. Authentic learning takes place with technology instead of from technology (Herrington et al., 2010). Here, we can see that gamification elements would aid in the authentic learning process effectively.

The gamified learning systems are becoming more common within educational institutions although there is a lack of understanding on the elements of gamification that would influence either positively or negatively on the learning experiences of students using these systems. According to a study by Geelan et. al (2015), they found different results on examining the implementation of existing gamified learning tool within a university in Australia. A combination of motivational and game-based elements such as presentation of content, self-efficacy of learning experiences and feedback gave positive influences on the students. On the other hand, issues such as interaction flaws and compatibility have negatively influenced the learning experiences among students. They added that a combination of good game design supported by motivational and educational theory is a core element of success. In addition, student engagement with learning activities is an important aspect of the educational experience and contributes significantly towards learning outcomes. Nevertheless, critical elements such as the levels of organisational support, the preferences of students, the general perception of games and the ability to continuously improve and add to the game are needed in order to maintain novelty, and extend the positive experiences.

Martinovic et. al (2013) claimed that children learning processes and outcomes could be improved via gaming. It means that the strengths and weaknesses of the child may also be identified to provide feedback for

improvement of learning and outcomes. In their study, they developed methodological tools to distinguish different types of cognition that are involved in playing simple single-player games and to connect them to player's attributes that could be verified and measured during game play. They also showed various ways in which computer games may be used throughout life to achieve certain goals like reduced memory loss, improved reaction time, or improved understanding of subject-related concepts.

The design of assessments within virtual environments to aid in authentic learning, supported by gamification elements were discussed in a study conducted by Wood et. al (2013). They investigated the elements that support the assessment design such as rewind, ghost images, save points and multiple lives, and time and space control. The merging of the game elements with the authentic learning tasks in the same context would not create biasness in the participants' perception towards achieving badges but working towards overall objectives. Hence, a careful design on the gamification mechanisms is crucial to ensure an effective implementation.

FEATURES IN GAMIFICATION FOR EDUCATION

Embedding gamification approach in education is where the students can experience as they are playing games those have been translated into educational context thus helping the learning process become more interesting and influencing. The designing process for developing learning materials that embedding the gamification approach needs to be well-planned to make sure the gamified products successfully fulfilling the learning outcomes for the topics as well as including features that can attract the students to continue learning. According to Kiryakova et al (2014), the objectives or the learning outcomes of the course will determine which features to be included in the gamified learning materials. Previous researches on gamification approach for different levels of education discovered that features those are usually included in gamification for educations are recognition for players' achievement, offering rewards, having good and interesting storyline, time, personalization, interaction and have fun and learning orientation.

i) Achievement

Typically, people will feel satisfied after they have performed or fulfilled certain achievement in their life. This achievement will motivate them to keep on improving their current condition. In most of games, the progress or score for players will be determined by level. Usually it starts with level 1, followed by level 2, level 3 and so forth and the players need to complete one level after one another. The satisfaction feeling after accomplish certain achievement in one level will be a drive factor to players to move on next level which will be more challenging than previous one. Moving to next level requires players to be more prepare with higher confidence level and motivation to play as the games will test more skills and knowledge of the players.

Therefore, when this element has been applied in gamification for education, it will increase the motivation to learn among students so that they can accomplish the level and perform well in the games. Besides, it also may improve their fear of failure and confidence level.

ii) Rewards

Everybody likes rewards and it can be a good factor to motivate people. After players has completed certain task or level with a good score or they have accomplished special achievement, the players will be granted with a certain rewards. These rewards may be in forms of badges, bonus points or stickers. Collecting these rewards will signify the players' progress along the game.

In gamification for education, players may be rewarded after they have completed certain tasks or levels of game. Rewards also may be given on their special or unexpected achievement. Players may be motivated by these rewards and will perform and do their best. Along the way, they will ensure themselves with the knowledge to collect more rewards and of course to win the games.

On the other hand, Sonts (2013) mentioned that, in gamified activities, rewards should not be the main elements since gamification is more on application of games mechanism into non games context instead of collecting pints and scoring. Besides, too much rewards can be a distraction to achieve the the main objective of gamification in education. Students will

focus more on winning the rewards instead of focusing the course content. In addition some students may refuse to learn without these rewards.

Hence, giving rewards is important in gamification but it should not be overused and become the main factor in gamified activities.

iii) Storyline

Gamification educational products having a storyline embedded with variety of characters provides more interesting environment and settings. The idea can be expanded for suitable theme and storyline that can be fictions or inspired by real life situation. Most of mathematics, statistics or economics games contained exercises that have been found in the exercise books that has been added with the graphics or modified into games environment. Therefore to ensure that it able to capture student's interest, the exercises may be designed with a storyline that makes it more fun.

As an example for mathematical courses, instead of completing the exercises, the player may be given a storyline that they trying to save a princess that lived in a locked castle by 10 layer doors. Therefore, the player needs to complete all exercises for each layer to open the 10 doors. In completing the objective to save the princess, the player or students must be able to answer all the exercise which will test their knowledge and skills. The feeling of excitement and satisfaction will come along the way and it will become the motivation factor to complete the game with good score as well as improving their knowledge on the course itself.

iv) Time

To be more effective, gamification needs to be completed within certain time frame. This will give students time pressure in playing the game. However, this kind of activities can encourage students to be more timed-objective and enhancing students' time management skill. They will tend to focus on the activities or tasks given to ensure that they can accomplish the mission within the time given or getting high scores for minimum time spent.

v) Personalization

Every people have different characters, skills and preferences. Gamified educational and penalties, materials can be more interesting when it allows players to customize their own preferences or has the personalization elements. A player will be tested at right level in the right way. For example, the player will has options to choose their own character to be used in the game and choosing settings and user interfaces that they prefer. It will make the player happier and enjoy in completing the tasks and levels given.

vi) Interaction

Interaction is a feature that allows students to feel involved in the games environment when they obtained responses during and after performing particular tasks, in form of messages, scores or rewards and penalties. A good gamification for education is when it provides interaction with the students and makes the students to come and play again. As the students enjoy with the gamified materials and able to embrace the benefits of it, consequently it will brings the satisfaction to the students and the lecturers when both enjoyment and course learning outcomes successfully accomplished.

vii) Fun and learning orientation

The main objective of lecturers to shift from traditional teaching approach to gamification approach is generally to capture the students' attention and motivation to learn. The former method believed to be dull, unattractive and boring. Therefore, by applying gamification approach in teaching and learning activities, it believed that it will provide more interesting way of learning. Using fun materials in learning activities is more attractive and able to capture students' attention.

In addition, fun in the learning process creates more peace and calm environment. Calm and peace environment will make students to be more relaxed and takes thing more easily in completing the tasks given. Hence, in applying gamification for education, we must ensure that the elements of fun exist although the main objective is to improve student's knowledge and skills.

ADVANTAGES OF USING GAMIFICATION APPROACH IN TEACHING AND LEARNING ACTIVITIES

Many of the studies indicate that gamification provides benefits and positive effects in the teaching and learning process. Based on the growing numbers of papers published on gamification, this suggests that gamification is becoming a more popular subject for academic inquiry.

i) Increase Motivation and Engagement

Currently education system has become quite challenging to motivate students to learn. The teachers or lecturers should make learning more interesting and students are interested in attending the class or lectures. Schools or universities management are concerned for student's attendance to the class or lectures by monitoring the students' attendance. Gamification approach motivates students to study and attend classes or lectures. In fact, gamification directly affects the students' engagement and motivation and it indirectly leads to acquiring more knowledge and skills. According to Rashid (2017), gamification has worked to motivate the students to take part in the activities and engage the students in all the education processes irrespective of their performance in the class. While Chapman and Rich (2017) studied on the motivational impact of specific game elements and how to form student motivational styles in educational gamification. They identified four motivational styles in educational gamification; personal progress, competition and praise, individual assignments and group work. Studies by Ibáñez et al. (2014) have shown positive effects on the engagement of students towards the gamified learning activities. The most successful mechanism to foster engagement was collecting badges especially among other game mechanics elements. Same with Muntean (2011) concludes that, the important metric for success in gamification is engagement.

ii) Fun and Enjoyable Experience

Refer to the experience of students in working with gamification, they were happy, and enjoyed the activity. Besides increased motivation and engagement, gamification provides enjoyment over the students. Perrotta et al. (2013) found that majority of teachers believed that gaming could help support children's cognitive development, their ICT development,

and their higher-order thinking skills. Huang and Soman (2013) stated that gamification serves the purpose of minimising negative emotions compared in traditional forms of education. Besides developing students' knowledge and skills, the learn-by-failure technique in games environment will drive the students to complete the tasks without the embarrassment factor. While Muntean (2011) claimed that gamification makes education more fun and engaging, without undermining its credibility. Overall, the use of game mechanics such as badges, points and leader boards made the course activities more enjoyable and fun discussed by Tan and Hew (2016). Many of the studies agree that statistically significant improvements in terms of increased motivation and task commitment and enjoyment are connected based on gamification.

iii) Increase Interest Level

The students obtained positive values by having gamification approach in teaching and learning and makes the course content more interesting. Most of the games work on rewards system which is usually known as PBL system; Point/Prizes, Badges/Achievements, and Leadership board. Thus, to achieve the rewards, the students must think like a problem-solver, innovator and critical thinker to overcome the challenge. Thus, this rewards system would make learning become interesting. Furthermore, gamification promotes healthy competition as anyone can earn points and badges provided they take part in the games which conducted as classroom activities. Besides that, Rashid (2017) found gamification increases engagement and creates a positive vibe. As the result, students are becoming more interested towards the learning process and be more competitive while learning with the rewards system.

iv) Emerging Technologies for Teaching and Learning

As instructors or lecturers, it is the time to improve traditional educational tools and approaches such as lectures, discussions, lab reports, tests, and textbooks by developing gamified materials in helping students overcome the learning difficulties in classroom. Johnson et al. (2014) identified the emerging technologies that are bound to have a significant impact on learning, teaching and creative thinking in higher education. This technology involved gaming and gamification whose impact on education

as well as the real presence of these key trends in university training contexts. Therefore, it is important to work gamification into initial training in education process to enhance their future professional performance. Hamari, Koivisto and Sarsa (2014) mentioned that, most of the studies of gamification approach based on education or learning contexts. The most popular example learning contexts nowadays are e-learning and Massive Open Online Courses (MOOCs) environment. Gamification in e-learning or MOOCs provide an effective, informal learning environment, and helps learners practice real-life situations and challenges in a safe environment. Study done by Glover (2013) stated that the principles of gamification are mostly derived from computer games and have some online element. However, gamification can be also applied to non-electronic contexts.

v) Encourage Feedback and Social Connections

To facilitate better learner engagement, gamification encourages instant feedback so that students know what they know or what they should know. For example, students will try the quiz or activity again and again to get a higher placement or creates motivation for further lesson engagement. Glover (2013) stated that good feedback should outline what the learner has done and give guidance on how to improve in the future. Study done by Muntean (2011) declared that the positive feedback from gamification pushed the students become more interested and stimulated to learn. Moreover, it can be a powerful booster to determine them to study more. Sometimes, to collaborate on challenges, the students must create team competitions. Therefore, the students indirectly make social connections with other students in their courses.

The gamification is very important to increase motivation and engagement among the students. It desires to combine intrinsic motivation with extrinsic to raise motivation and engagement. Moreover, gamification makes the learning and teaching process much fun and enjoyable experience either to students or teachers. It can be also being seen that the students were influenced by extrinsic rewards and increase the interest level when see their names on the leader board among toppers. Moreover, by using gamification it will emerging technologies for teaching and learning environment such an e-learning application and MOOCs. This is not limited to computer science students only but gamification approach provides an alternative means for

educators to engage any students during the teaching and learning process. Gamification also encourages feedback and social connections with other participants. Most of the students need to be engaged more to change from passive to active participant. Thus, gamification had a desirable impact on the students.

CONCLUSION

Gamification approach can increase students' engagement and understanding the terminology or subject matters as it requires different way of thinking to achieve the goals in the game environment. By implementing variety of teaching delivery methods such as written assignments, group discussions, presentations, and quizzes conducted during lecture sessions, the methods can also be supported by improving the learning materials. The students also can keep the contents longer in mind since gamification can constitute a great progress as they experienced in the game environment themselves. A study done by Sandunsky (2015) discussed on the impacts of gamification in classroom and reveals that using simulating environment to students is significantly enhance student's motivation and engagement and by incorporating gamification in e-learning, it can helps students remember 90% of the content thus will help in memorizing terminologies.

Turan et al. (2016) also investigated the effect of gamification on students' achievements, cognitive load levels, and perceptions. A gamification-based strategy was also compared with traditional methods in their study. From their study, the experimental group students, who were taught using the gamification approach, earned better achievement scores than the control group students. The positive result could be influenced by the suitable design and content of the gamification process as well as by the high average age in the study samples. Turan et al. (2016) conducted a mixed method study and according to the qualitative data obtained in the study, the students gave positive attitudes towards gamification strategies and wanted other lessons to be taught via this method. They concluded that gamification can increase both cognitive load and achievement levels, and students generally have positive thoughts regarding gamification strategies. When gamification is applied, the cognitive load factor must be considered and certain precautions must be taken to maximize effectiveness.

Incorporating gamification features in educational materials discussed in this chapter will not only improving students' engagement towards the course content, but it eventually will upgrading the learning materials from the conventional learning tools into a refined materials with purposed learning outcomes. Learning materials can be enhanced and converted into education products by changing the representations of terminology into visual and embed the gamification elements to help both lecturers and students to accomplish the course learning outcomes. The delivery of the knowledge can be transform into interesting and interactive environment that can be an addictive learning process for the students. Adopting the idea of learning by failure approach and enthusiasm to earn points in game environments, the learning materials will gradually develop students' good attitude and behaviour such as teamwork and leadership as well as giving them motivation to learn the contents of course. The learning materials can make teaching and learning more fun and engaging students with the contents and consequently improve students' performances for the course. As for the lecturers, gamification approach will add a new teaching methodology that not only can improve students' performance and engagement during knowledge acquisition process, but also give motivation to them to complete the game and promote good behaviour among students as they experience competitive learning situation. Gradually, it will affect the performance of the students towards the course contents and generate environments for effective learning process.

REFERENCES

- Bajko, R., Hodson, J., Seaborn, K., Fels, D.I.(2015). Guilds, Die Rolls, and Leaderboards: Gamification of Two Undergraduate Multimedia and Social Media Courses. Information Systems and Computing Education (EDSIG), 2015 Conference on (paper N3460). ISCAP.
- Barsegian, T. (2011). How games can influence learning. Retrieved from <https://ww2.kqed.org/mindshift/2011/10/14/how-games-can-influence-learning/>
- Çakıroğlu, Ü., Başbüyük, B., Güler, M., Atabay, M., & Memiş, B. Y. (2017). Gamifying an ICT course: Influences on engagement and academic performance. *Computers in Human Behavior*, 69, 98-107.
- Chapman, J., & Rich, P. (2017, January). Identifying Motivational Styles in Educational Gamification. In *Proceedings of the 50th Hawaii International Conference on System Sciences*.
- Chen, P., Kuo, R., Chang, M. & Heh, J. S. (2009). Designing a Trading Card Game as Educational Reward System to Improve Students' Learning Motivations. In: Chang M., Kuo, R., Kinshuk, Chen GD., Hirose M. (eds) *Learning by Playing. Game-based Education System Design and Development*. Edutainment 2009. Lecture Notes in Computer Science, vol 5670. Springer, Berlin, Heidelberg
- Cózar-Gutiérrez, R., & Sáez-López, J. M. (2016). Game-based learning and gamification in initial teacher training in the social sciences: an experiment with MinecraftEdu. *International Journal of Educational Technology in Higher Education*, 13(1), 2.
- Geelan, B., de Salas, K., Lewis, I., King, C., Edwards, D., & O'Mara, A. (2015). Improving learning experiences through gamification: A case study. *Australian Educational Computing*, 30(1).
- Glover, I. (2013). Play as you learn: gamification as a technique for motivating learners. J. Herrington, et al. (Eds.), *Proceedings of World Conference on Educational Hypermedia and Telecommunications*. pp.

1999-2008.

- Hamari, J., Koivisto, J., & Sarsa, H. (2014, January). Does gamification work?--a literature review of empirical studies on gamification. In *System Sciences (HICSS)*, 2014 47th Hawaii International Conference on (pp. 3025-3034). IEEE.
- Herrington, J., Reeves, T. C., & Oliver, R. (2010). *A guide to authentic e-learning*. New York: Routledge. http://researchrepository.murdoch.edu.au/id/eprint/1903/1/a_guide_to_authentic_learning.pdf [accessed Jul 13, 2017].
- Huang, W. H. Y., & Soman, D. (2013). *Gamification of education*. Research Report Series: Behavioural Economics in Action, Rotman School of Management, University of Toronto.
- Ibáñez, M. B., Di-Serio, A., & Delgado-Kloos, C. (2014). Gamification for engaging computer science students in learning activities: A case study. *IEEE Transactions on Learning Technologies*, 7(3), 291-301.
- Johnson, L., Adams Becker, S., Cummins, M., & Estrada, V. (2014). *NMC technology outlook for Australian tertiary education: A horizon project regional report*. Austin, Texas: The New Media Consortium. Cover image courtesy of Open Universities Australia ISBN, 978-0
- Keeler, A. (2015). *Gamification: Engaging students with narrative*. Retrieved from <https://www.edutopia.org/blog/gamification-engaging-students-with-narrative-alice-keeler>
- Khaleel, F. L., Ashaari, N. S., Meriam, T. S., Wook, T., & Ismail, A. (2015, January). The study of gamification application architecture for programming language course. In *Proceedings of the 9th International Conference on Ubiquitous Information Management and Communication* (p. 17). ACM.
- Kiryakova, G., Angelova, N., Yordanova, L. (2014). *Gamification in Education*. Proceedings of 9th International Balkan Education and Science Conference

- Laskaris, J. (2014, July 30). 30 facts about gamification in elearning. eLearning Industry: <http://elearningindustry.com/30-facts-gamification-in-elearning>
- Martinovic, D., Whent, R., Adeyemi, A., Yang, Y., Ezeife, C. I., Lekule, C., & Frost, R. A. (2013). Gamification of life: Playing computer games to learn, train, and improve cognitively. *Journal of Educational and Social Research*, 3(8), 83.
- Muntean, C. I. (2011, October). Raising engagement in e-learning through gamification. In *Proc. 6th International Conference on Virtual Learning ICVL*(No. 42, pp. 323-329).
- Nah, F.F.,Telaprolu, V.R., Rallapalli, S., Venkata, P.R. (2013). Gamification of Education using Computer Games, S. Yamamoto (Ed.), HIMI/HCII 2013, Part III, LNCS 8018, pp. 99-107.
- Perrotta, C., Featherstone, G., Aston, H., & Houghton, E. (2013). Game-based learning: Latest evidence and future directions. NFER Research Programme: Innovation in Education. Slough: NFER.
- Rashid, M. B. (2017). Gamification: An Initiative to Increase Engagement and Performance in Education. *International Journal of Advance Research, Ideas and Innovation in Technology*. pp 7-16.
- Sandusky, S. (2015). Gamification in Education. The University of Arizona. Retrieved from <http://hdl.handle.net/10150/556222>
- Schreuders, Z. C., & Butterfield, E. M. (2016, August). Gamification for teaching and learning computer security in higher education. In 2016 USENIX Workshop on Advances in Security Education (ASE 16). USENIX Association.
- Sonts, K. (2013). Gamification in Higher Education. The Case Study on the “Game Interactions” Course (Master Thesis). Tallinn University, Estonia.
- Tan, M., & Hew, K. F. (2016). Incorporating meaningful gamification

in a blended learning research methods class: Examining student learning, engagement, and affective outcomes. *Australasian Journal of Educational Technology*, 32(5).

Turan, Z., Avinc, Z., Kara, K., & Goktas, Y. (2016). Gamification and Education: Achievements, Cognitive Loads, and Views of Students. *International journal of emerging technologies in learning*, 11(7).

Wood, L. C. & Reiners, T. (2015). Gamification. In M. Khosrow-Pour (Ed.), *Encyclopedia of Information Science and Technology* (3rd ed., pp. 3039-3047). Hershey, PA: Information Science Reference. DOI: 10.4018/978-1-4666-5888-2.ch297

Wood, L., Teras, H., Reiners, T., & Gregory, S. (2013). The role of gamification and game-based learning in authentic assessment within virtual environments. In *Research and development in higher education: The place of learning and teaching* (pp. 514-523). Higher Education Research and Development Society of Australasia, Inc.aaa

