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GAMIFICATION AND LEARNING: A REVIEW OF ISSUES AND RESEARCH

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This paper will review the literature on gamification and aim to apply principles of analysis for synthesize existing research, identify issues of controversy, uncover areas that future gamification research should investigate. The paper starts with an introductory paragraph which gives an overview of the topic (i.e., define the concept, identify the characteristic components, discuss about the elements of a gamified experience). Then, the attention is focused on gamified learning, in order to investigate what happens when gamification is introduced in class, especially on student's motivation, engagement, and performances. The last part focuses on the lines of research to be pursued in the area of gamification and suggestions are made regarding those aspects which would benefit most from future research.

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1 Introduction to the concept of gamification

The term gamification was coined in 2002 (Marczewski, 2012) and has made its appearance in 2008 in education technology literature (Deterding *et al.*, 2011a). In 2010 the term begins to be used more frequently, but still there are not many systematic studies that have dealt with this subject and for this reason reference to games and video games is inevitable.

By analyzing the different definitions of gamification in the international literature (Deterding *et al.*, *op. cit.*; Marczewski, *op. cit.*; Perrotta *et al.*, 2013; Simões *et al.*, 2013; de Sousa Borges *et al.*, 2014), we have noticed a substantial agreement among contributors who consider gamification as an approach that uses game features (elements, mechanics, frameworks, aesthetics, thinking, metaphors) into non-game settings. The term gamification is used in relation to many issues - the pervasiveness and ubiquity of computer games and video games in everyday life; the need to arouse and maintain students' interest in learning - with the aim of involving users and encouraging them to achieve more ambitious goals, following rules and having fun. Therefore gamification is recommended for applications in the areas of daily life where boredom, repetition and passivity are prevalent to encourage a desired type of behavior.

In the paper, we will focus on applications of the gamified approach to the field of education to improve motivation and engagement, and maximize learning. In this first paragraph we give an overview of the topic, define the concept and identify its main elements.

In order to better understand the concept of gamification, we have to first clarify that gamification does not employ games for non-entertainment purposes, as serious games, but rather it affords elements of a game experience to improve retention. Apostol *et al.* (2013) identify eight elements of games that are used for the gamification of learning, such as: rules, goals and outcome, feedback and rewards, problem solving, story, player(s), safe environment, sense of mastery. But the question of what and how many game features should be used for the gamification of learning is still debated. Reading and summarising the key views from literature, we have noticed there is disagreement among the experts. Marczewich (*op. cit.*) argues that with even a single feature of the game we can already gamify a learning experience. In contrast, Kapp (2012) distinguishes between those features that can lead only to a superficial level of engagement by learners and those that are of the most value. The first one is all those who can serve only as sources of extrinsic motivation, such as rewards, points and badges. The others are story, challenge, sense of control, decision making, and sense of mastery. They take up the challenge of giving the students «both a sense of autonomy and competence as he or she voluntarily undertook tasks to improve competence» (p. 98). Above all Kapp believes that «multiple

elements are required to make a game an effective learning experience. It is the interplay of the elements that makes for the most effective games» (p. 50). Since there is no empirical evidence for and against, Apostol *et al.* (2013) conclude that «the best way for an instructional designer or a teacher to select the elements of game is to consider the educational objectives and the desired outcomes of the learning process» (pp. 68-69). Moreover, de Sousa Borges *et al.* (2014) note that «in gamification approaches, these elements are not the center of the system, but have the purpose of motivating users to use it» (p. 217). Perrotta *et al.* (2013) have associated the game mechanics to processes involved in the learning experience. They believe that gamification of learning is intrinsically motivating because rules are inputs to broad range of decision making processes; fun because goals allow student to see the direct impact of their efforts; authentic because fantasy provides a compelling background that allows students to experiment with skills without suffering the consequences of failure in real life; self-reliance because feedback guides students to facilitate and correct performance; experiential because social element allows students to share experiences and build bonds.

2 A review of literature on research issues

Gamification is identified as one of the emerging technologies that will have a great impact in schools of the most technologically advanced countries in world (Johnson *et al.*, 2014) and considered a new approach that can bridge the generation gap between teachers and students (Kapp, 2007; Oblinger, 2004). It is in these contexts that experts have praised the versatility of gamification, used in classroom lecture, as homework assignment, as final examination or as main learning activity for motivate students, improve their skills, or maximize learning.

The literature on gamification often stresses that the judicious, strategic, and appropriate use of game elements can produce a learning situation characterized by a high level of active engagement and motivation, which in turn produces positive outcomes in cognitive, emotional, and social areas. Yet, there are scholars still have identified the limitations of gamification: it may trivialize the subjects to be learned; learning works can be taken as just a game; certain games are better suited for encouraging the learner to operate with concepts and notions rather than to assimilate them; games alone are not enough to enhance performance; learning difficulties can not be overcome just with games (Apostol *et al.*, *op. cit.*).

Although there is little research regarding gamification in education, the results of research studies in these areas offer a more complex view of what happens when gamification is introduced, especially on student's motivation,

engagement, and learning outcomes. The factors of motivation, engagement, and learning outcomes have by far been the most extensively studied of the numerous factors that gamification seems to influence. In the next subsections let's synthesize the findings of empirical investigations of the manner in which gamification impacts on them.

2.1 Gamification and motivation

A substantial body of research suggests that game elements may actually increase intrinsic motivation levels only when they make boring tasks interesting. When they increase extrinsic motivation, intrinsic motivation levels drop significantly, resulting in less enthusiasm for work. These results are in agreement with the self-determination theory (Deci *et al.*, 1985) and the research on game play (Caillois, 2001), according to which rewards and incentives decrease a person's intrinsic motivation to perform a task.

For example, Hanus e Fox (2015) have tested the motivation by comparing students of two classes. The same curriculum was used in all two classes but gamified elements were introduced in one of them. Results have showed that students of gamified class have lower levels of motivation and lower score on final exam. The researchers have concluded that the low scores on the final exams have been influenced by the levels of intrinsic motivation and that the negative effects on intrinsic motivation are attributable to gamification. The empirical evidences obtained from this longitudinal study are «align with existing literature on the negative effects of rewards on motivation» and suggest that «giving rewards in the form of badges and coins, as well as encouraging competition and social comparison via a digital leaderboard, harms motivation» (p. 159).

Moreover, the researches indicate that social elements are essential for creating motivating gamified learning. An experiment conducted on students of an e-learning course showed the negative effects of social comparison on motivation. The experiment proved especially that gamification is not an important motivating factor for all of them because some students do not like to compete with their classmates (Domínguez *et al.*, 2013). This result confirms the feedback collected in several of the studies, according to which «certain motivational affordances (which otherwise received positive comments) were felt as negative (such as ones encouraging competition), lending credence to the idea that different player types experience the same affordances differently» (Hamari *et al.*, 2014, p. 3030).

In this respect, we can claim that gamification focuses too heavily on the extrinsic motivator and the effects of gamification on motivation are not uniform for all students in the class. Researchers consider that it is important to use an

extended inventory of techniques balancing extrinsic with intrinsic motivators (Dichev *et al.*, 2014) and to design a system of gamification that can that can be customized in order to ensure that all students in class may enjoy the benefits of gamification (Hamari, 2013; Eickhoff *et al.*, 2012; Hamari & Koivisto, 2013).

2.2 Gamification and engagement

Engagement can be defined as student's attention to and absorption in a task but learning tasks are being imposed by teacher. Thus, student engagement is not a given. The integration of game elements and mechanisms into learning activities seems to ensure more engagement in class because it «has the advantage of introducing what really matters from the world of video games – increasing the level of engagement of students – without using any specific game» (Simões *et al.*, 2013, p. 347).

Studies state that gamification increases student engagement and participation in class and online settings (Hamari *et al.*, 2014b; Barata *et al.,* 2013) and, above all, experience points, levels, leaderboards, challenges and badges are the most consensual game elements used in gamification (Barata *et al.*, *op. cit.*). But instead research shows that engagement depends on several factors. First of all, the impact of gamified interventions on student engagement varies depending on whether the student is motivated intrinsically or extrinsically (Buckley & Doyle, 2014; Hamari *et al.*, 2014a). But secondly the research has shown that participation is empowering especially when the students can choose between gamification and traditional methods (Domínguez *et al.*, 2013; Mollick & Rothbard, 2014; Cheong *et al.*, 2013).

Some research found that the engagement decreases over time. Once the novelty wears off, the students interest in gamification fades (Koivisto & Hamari, 2014; Mollick & Rothbard, *op. cit.*), and the engagement fades away at incredible pace if all the learning contexts were gamified (Hanus & Fox, 2015). Therefore, the use of a long-term perspective in this field becomes indispensable with the purpose of investigate the novelty effect (van Roy & Zaman, 2015).

2.3 Gamification and learning outcomes

Lee and Hammer (2011) indicate some of the positive outcomes of gamification. They say game develops problem solving skills through a complex system of rules that encourages active exploration and discovery. They recognize the value of «concrete challenges that are perfectly tailored to the player's skill level, increasing the difficulty as the player's skill expands». They also emphasize the importance of the "emotional area" that refers to all the powerful emotions that you feel playing - such as pride, joy, optimism, and curiosity - but also

involves the frustration at the failure. In their view, games offer the possibility of "reframing failure as a necessary part of learning" due to the fact that error becomes an opportunity to try, to practice, and to improve. Therefore, gamification determines an emotional transformation because the stakes of the failure is not high; on the contrary the repeated failures allow to learn something more and new. They also insist on the social dimension of gamified environments that allow students to publicly identify themselves, to boost social credibility, to have recognition of achievements, which might otherwise remain invisible.

This positive outcomes in cognitive, emotional, and social areas should also ensure positive effects on performance of students and their scores (Kapp, 2012; Connolly *et al.*, 2012; Ke, 2009; Sitzmann, 2011); in particular, Domínguez *et al.* (2013) indicates that a frequent, meaningful and rapid feedback can improve student results.

Overall, the study revealed the effects are greatly dependent on the users using it. In fact, students who have been taught with traditional methods have had the same score as others who have had the gamified exercises. Some studies have shown that students can oppose "mandatory fun" and, above all, can consider binding the reward system that is imposed (Mollick & Rothbard, 2014).

Conclusions: Toward future research in the area of gamified learning

The review of literature and fieldwork findings has revealed clearly that potential of gamification to improve learning experiences and outcomes has not been established experimentally and, then, it is not possible to have unequivocal indication on how to use gaming elements in educational process. Against this background, there is wide agreement about the need for customization of the gamified learning, for considering how different students are affected by gamification and what are the impacts of gamification on the various profiles that make up the class (Hanus & Fox, 2015; Barata *et al.*, 2015). As mentioned above, the research studies seem to issue two types of warnings: we must pay careful attention to the environment and often change the design to generate a greater impact on motivation. Evidence supporting the necessary to create a gamified environment with clear goals, challenging tasks, and authentic stories in which team spirit is fostered through game mechanics, discussions and debates. Furthermore, these gamified environments have to meet student learning needs as well as suggest that gamification has to add an aspect of enjoyment or novelty. Also the voluntary nature of participation needs to be ensured because the research has shown that the efficacy of gamification is greater when student can choose. The obligation affects the essence of the gamified activity and reduces the student motivation (Mollick & Rothbard, *op. cit.*; Cheong *et al.*, 2013). Finally, feedback can increase student motivation and improve their

results; so research studies suggest that gamified learning experiences should have early, frequent, meaningful and rapid feedback (Domínguez *et al.*, 2013).

On the other hand, however, the methodological limitations of many of these empirical studies on gamification were noted: they suffer from small sample sizes, to use no well-validated psychometric measurements, to rely solely on user evaluation, to investigate multiple affordances as a whole, to present only descriptive statistics, to have experiment time frames very short, to present a lack of clarity in the research report (Hamari, Koivisto & Sarsa, 2014). The quality of research needs to be improved so that progress can be made. In particular, Hamari (2014) states that the data comparability issues in international research on gamification can be overcome both with adequate psychometric measures and with appropriate samples.

Scholars are agreed that integration of game elements in class requires more careful consideration of their strengths and weaknesses rather than thinking of gamification as the educational panacea. They also have proposed several lines of research to be pursued in the area of gamification. First, «research should investigate specific elements of gamification rather than as an overarching concept» (Hanus & Fox, 2015, p. 160). It should isolate game features and evaluate their effectiveness in the teaching/learning process for understand how design a system of gamification that can promote and increase intrinsic motivation (Morris *et al.*, 2013). In addition, it should identify the conditions under which the gamification affects performance and scores for individual participants in class. Second, research should consider technology affordances and their connections with gamified systems for understand how technology in class will make easier to incorporate game features for greater students engagement. The third aspect to take into account is related to transfer of knowledge from context of gaming into non-game context. Research has not yet clarified if context of gaming allows the transfer of knowledge as it is dissimilar from traditional educational settings (Hanus & Fox, *op. cit.*; Barata *et al.*, 2015).

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