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GAMIFICATION AND SERIOUS GAMES METHODOLOGIES IN EDUCATION

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Abstract: *Gamification as a concept was defined for the first time two decades ago, as the use of game elements in a non-game context. Specific game elements like points, challenges, badges and leaderboard are incorporated in the learning process in order to increase motivation, engagement, and satisfaction to students. On the other hand, serious games are interactive video games that have a defined purpose of learning and practicing skills rather than entertainment. Serious games aim to improve problem solving skills, critical thinking and learn specific knowledge through playing video games that are software that have specific learning oriented purpose. The first purpose of this paper is to compare and contrast different aspects of gamification and serious games in the education domain, in order to identify appropriate applicable environments for these two approaches. Another purpose is to identify models and frameworks to apply gamification and serious games that are more effective to increase motivation and engagement to students. The final purpose is to identify in which courses these approaches are more applicable and help to improve the learning process by increasing creativity, motivation, engagement and problem solving skills. Methodology of this research is realized by analyzing different research papers in conferences proceedings and journals in the last two decades for concepts of game based learning, gamification in education and serious games evolved over the years. Also questionnaires are conducted for academic staff of Albania universities to measure perception and identify challenges and strategies of incorporating these approaches in the learning process. We conducted qualitative and quantitative research analysis in order to achieve results to fulfill the purposes of this research in all the aspects. This research represents conclusions and recommendation related approaches to evolve gamification and serious games methodologies in the education system in Albania. The paper aims to suggest practices and some of the most appropriate and effective models to apply gamification and serious games during the learning process.*

Key words: Serious Games, Gamification, Engagement, Motivation, Learning Process

1. INTRODUCTION

In the last years, researchers as well as different industries have increasingly expanded their focus and interest from pragmatic issues of human-computer interaction, to include aspects like user-experience, emotion, satisfaction and motivation (Deterding, 2011). One of the methods that comprise this concept is called “Gamification”: the use of game design elements in non-game contexts (Deterding et al., 2011). The purpose of gamification methodology is to drive user engagement, and motivate users to engage an application or service by making it ‘fun’ and joyful to use. Gamification, in other words, is extracting different game elements like points, challenges, badges, and leaderboard to a non-game context like education, business, and marketing. Gamification is used in a variety of contexts and scenarios, but this paper aims to demonstrate the importance in the educational environment. Existing reviews on gamification literature have indicated that education and learning are the most common contexts for empirical research of gamification (Koivisto & Hamari, 2014). By incorporating game elements in the learning process we aim to increase motivation, however we need to pay attention to the integration of tasks and exercises within the game design (Von Ahn & Dabbish, 2008). The other methodology that comprises the human-computer interaction, that include user-experience and motivation are serious games. In the past decades, the fast development of the tech industry, together with rapid development of the serious games industry, has become an important method to incorporate in technology in order to receive better results. Different from gamification that use and extract specific game elements in a non-game context, serious games are referred to entertaining tools with a purpose of education, where players cultivate their knowledge and practice their skills through overcoming numerous hindrances during gaming (Juan et al., 2017). Players’ performances are scored during the gaming process and in case players overcome a hindrance, they will obtain some awards, such as points, advancement and

power to classify in leaderboard. The most important reason for the effectiveness of serious games in the education domain is their influence on learners' mood, motivation and engagement. Gaming plays an important role in mood formation such as happiness, surprise, sadness, and anger (Van der Wal et al., 2016). Effective serious games attempt to form a positive mood in order to motivate and engage players to continue the play process, leading to increased interest in gameplay through learning and doing specific tasks and exercises that have a specific learning purpose, as well as better academic performances. This research study, therefore, aims to find out the main features of successful serious games and gamification methodology and put forward constructive suggestions for designers and education institutions via reviewing significant works in the recent decade. We attempt to answer the following research questions: (1) What are the main purposes and differences between serious games and gamification methodology in education? (2) What are the positive and negative findings in use of serious games in education (3) What are the positive and negative findings in use of gamification methodology in education? (4) In which courses is more effective to apply gamification and serious games methodology? (5) What is the perspective of mentors and students in Albanian universities towards incorporating gamification and serious games in the learning process? This study makes an empirical and theoretical contribution to retailing literature by expanding the knowledge on application of these methodologies in education domain.

2. RESEARCH METHODS

In order to answer research questions, we obtained 697 results including 617 articles, 45 reviews, and 35 proceeding papers by searching "Web of Science" (involving four databases, i.e., CCR-EXPANDED, SSCI, ESCI) with the subject "gamification" AND/OR "gamified learning" AND/OR "serious games" AND/OR "education" AND/OR "learning".

The quality of publications was assessed by a three point criterion: (1) quality of research framework for answering research questions. The quality is classified into "high" if the study is conducted through a rigid research methodology including qualitative and quantitative research, The quality is considered "medium" if the study is carried out through a medium rigid research design through an experimental research; the quality is reduced to "low" if the study is weakly designed research, like self-reported evidence; (2) appropriate research methodology applied; (3) reliability of findings. Each of the selected publications was scored based on the above criteria and reviewed by researchers. The papers with high quality that fulfill research criteria were selected in this study.

However, we conducted a questionnaire for students and professors in Albanian Universities. The purpose of this questionnaire is to give an answer related to the two last research questions (1) courses that are effective to apply gamification methodology; (2) perspective of mentors and students towards incorporating gamification and serious games in the learning process. The survey was conducted online through google form for two weeks from 5th June to 19th June. We collected 207 results for that period of time.

3. FINDINGS

All the selected papers were reviewed and rigidly analyzed, whose results for the research questions were shown below:

3.1 Main purposes and differences between gamification and serious games

Gamification essentially is use of game elements in a non-game context, is a set of activities included in this case in learning environment with the purpose to solve problems by applying the features of games like points, challenges, levels, and leaderboard to increase engagement, motivation and satisfaction to learner's. In the other hand, serious games have the primary purpose to commit knowledge and technical skills. Entertainment is not the objective of serious games. The main difference between these two methodologies is that gamification is just an extra layer that is applied in the non-game context in order to motivate and engage learners, otherwise serious games are real game designed for a specific knowledge or technical skills learning purpose.

3.2 Positive and negative findings of applying serious games in education

The findings in serious games for learning most of them have positive results and support this approach to apply in the education system. However, there are few findings with negative results. Serious games could facilitate and improve learners' understanding of scientific conceptions due to the improved performances on science and the prolonged retention of science knowledge (Zhonggen, 2019). Gaming immersion and concentrating was also positively correlated with performance of science learning (Cheng et al., 2017). Serious games prove effective in enhancing cognitive abilities and effect, as well as pleasant and motivated mood, in general learning cases. Through analyzing 24 empirical studies, serious games were found to be helpful for learners to obtain cognitive abilities, and increase satisfaction of learning (R. L. Lamb, 2018). Education based on technology, such as serious games, improved learners' academic achievements and encouraged their participation in learning activities. Educational or serious games can act as effective tools to improve teaching in the sciences (Cheng et al., 2017). Serious game-based learning proved significantly more effective than non-game-based learning. Learners were engaged in serious games significantly longer than the non-game-based learning. In the former learning approach, learners and teachers were significantly more motivated, engaged, and satisfied compared with the latter. It was empirically evidenced that learners who learn through playing serious games were scored significantly higher than those who did not learn through gameplay although significant differences in knowledge exams were not revealed (Roozeboom, Visschedijk & Oprins 2017). Some negative results were found especially in terms of the correlations between mental workload and learning effect. The nature of serious games negatively influenced the relationship between mental workload and learning effect (Cowley et al., 2013). In case the serious game makes the mental workload heavier, the learning effect tends to be negatively influenced (P.Wouters, 2013). In order to summarize these findings and enhance the readability of the paper, positive and negative findings are summarized in Table 1.

Table 1: Summary of, positive and negative findings of serious games

Items	Findings
Positive findings	● Facilitate learner's understanding of scientific concepts (Cheng et al., 2017) ● increase satisfaction and motivation during the learning process (Zhonggen, 2019) ● provide flexible and dynamic learning (Garneli, Giannakos & Chorianopoulos, 2017) ● facilitate socio-cultural learning in terms of cognitive and motivational effects and team cooperation (Wouters et al., 2013) ● obtain cognitive skills ● increase positive affect of learning and improve teaching in the sciences (Lamb, 2018)
Negative findings	● no improvement in-depth and detail-oriented learning ● Some serious games framework aggravated the mental workload and decrease learning performance (Cowley, Heikura & Ravaja, 2013)

3.3 Positive and negative findings of applying gamification in education

The findings in implementing gamification approach for learning, most of them have positive results and are implemented in the learning process, however there are few downside related gamification. Gamification helps students gain motivation towards studying, and because of the positive feedback they get pushed forwards and become more stimulated to learn. Gamification can constitute a powerful boost to determine them to learn more in a pleasant and satisfied environment. Based on research, it is revealed that a gamified learning environment is positively correlated with a student's grades and performance in the learning process (Grangeia et al., 2019). Furthermore, gamification is a low-cost tool and easy to incorporate in existing learning environments with high effective performance (Majuri, Koivisto, & Hamari, 2018). Some negative results were found especially in terms of effectiveness in the long-term. Gamification resulted that the effectiveness towards the learners' decrease when applied for long-term because game elements, rewards, do not provide long term satisfaction (Rodrigues, Pereira & Toda, 2022). However, results revealed that gamification does not increase the performance to the

learners that are not performance oriented. In order to summarize these findings and enhance the readability of the paper, positive and negative findings are summarized in Table 2.

Table 2: Summary of influent factors, positive and negative findings of gamification

Items	Findings
Positive findings	● Increase learning activities in a gamified environment, positive correlation between student's grades and gamified learning process (Grangeia et al., 2019) ● Game elements can support different motivational types; potential to counter the downward trend in students' autonomous motivation; personal characteristics mediate between gamification and motivation (Van Roy, 2018) ● User types react differently to gamification mechanics; gamification is valuable for designing smart technologies to design, boost, and maintain users' engagement (Leclercq, Poncin & Hammedi, 2017) ● Gamification is a low-cost tool to implement and high-effective in education domain (Majuri, Koivisto, & Hamari, 2018)
Negative findings	● Less effective in the long term application because rewards do not provide long term satisfaction (Rodrigues, Pereira & Toda, 2022) ● Increase performance only to a limited target group, for learners that are performance oriented

3.4 Courses that is more effective to apply gamification and serious games methodology

Based on the responses collected in the questionnaire we concluded that "Applied Sciences" are the most appropriate courses to implement gamification and serious games methodology. As shown in the chart below, 128 of the students and mentors responded that applied science like computer science, engineering and architecture are the most effective courses to apply these gamified technologies.

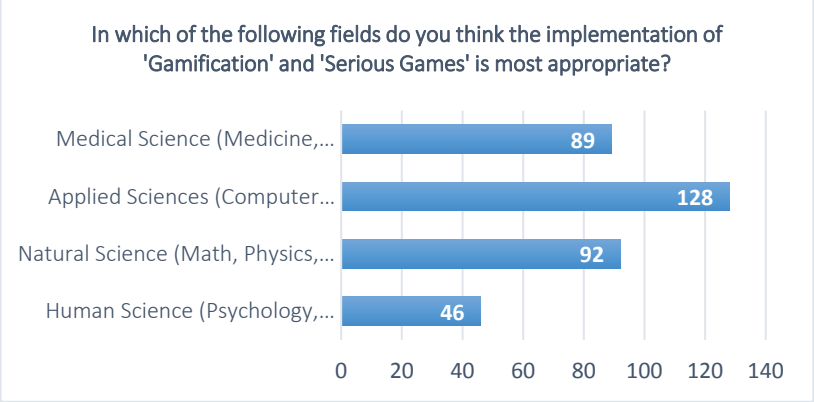

Figure 1: Courses that are more effective to apply gamification and serious games methodology

3.5 Perspective of professors and students in Albanian universities towards incorporating gamification and serious games in the learning process

Based on the results of the survey we concluded about the perception of students and mentors towards incorporating these gamified methods in learning process. We concluded that 79 of 207 students and mentors response agree that serious games and gamification could improve performance of students related academic achievement. Most students and mentors think that gamification is more appropriate to incorporate in the education system than serious games. The pie chart shows that 65% of responses agree for gamification and 35% of responses agree for serious games. On the other hand, the perception of responders related to the effectiveness of these methodologies to implement in education shows that 54% responds agree for serious games and 46% of them for gamification. Based on the results we can conclude that gamification is more appropriate and easy to implement in the education domain, however serious games are more effective in the long term to keep learners engaged and motivated.

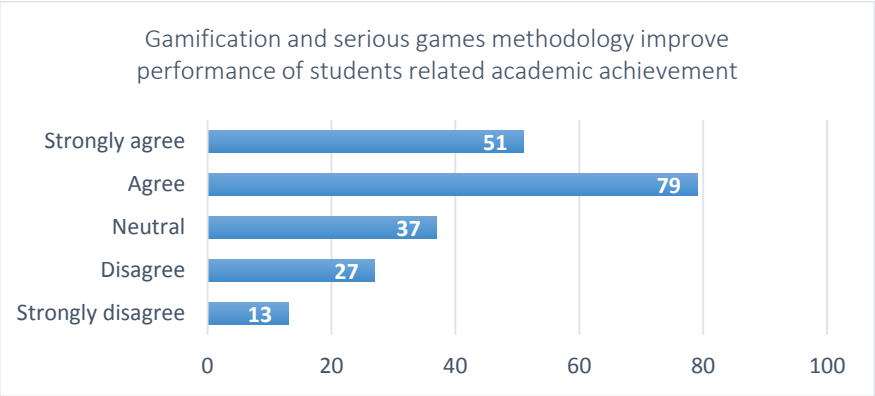

Figure 2: Perspective of mentors and students towards gamified methods in academic achievement

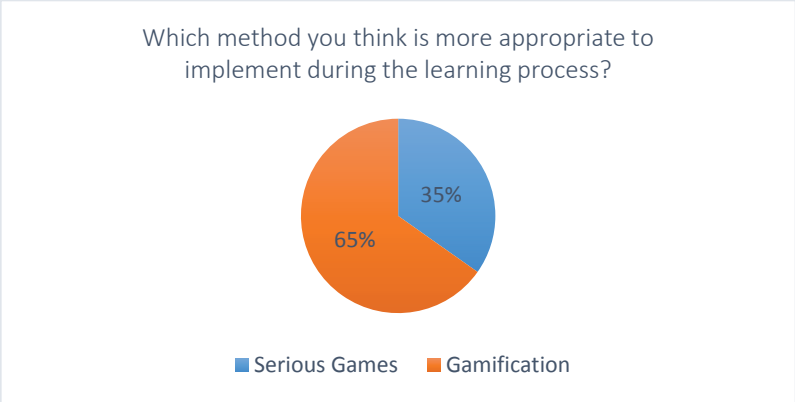

Figure 3: The most appropriate methods to implement in learning process

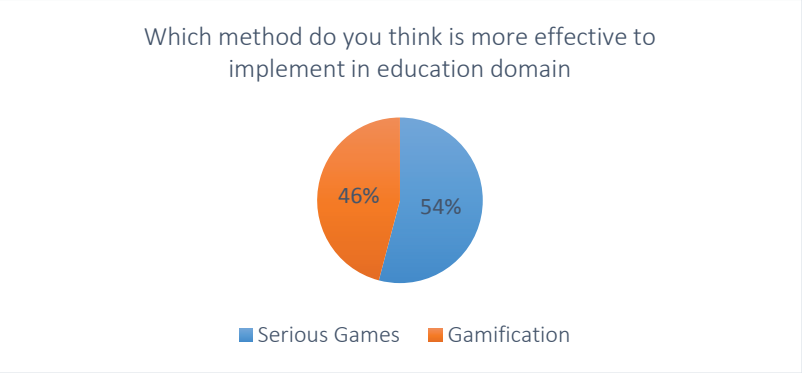

Figure 4: The most effective gamified method to apply in education domain

4. CONCLUSIONS

Gamification and serious games are educational innovations that have proved to have a positive effect in the education domain. Researchers often advocate that gamification and serious game's impact is positive due to its novelty, gamified environment, rewards and that it consequently vanishes as the novelty passes. Gamification and serious games have different concepts and purposes (Grangeia et al., 2019). Gamification is just an extra layer that is applied in the non-game context in order to motivate and engage learners, otherwise serious games are real games designed for a specific knowledge or technical skills learning purpose. Based on our research we reveal that both these methods in general have positive effectiveness in the education domain. Furthermore, this research concluded that gamification is more appropriate and easy to implement in the learning process, while serious games are more effective for

long term motivation and engagement to learners'. Prospective students and mentors encouraged implementing these methodologies in the learning domain. Ultimately, our conclusion is that gamification and serious games impact positively on students' engagement, motivation, and facilitate the learning process.

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