ACTA DIDACTICA NAPOCENSIA
Volume 14, Number 1, 2021 - DOI: 10.24193/adn.14.1.8

PROSPECTIVE PRESCHOOL AND PRIMARY SCHOOL TEACHERS' KNOWLEDGE AND OPINION ABOUT GAMIFICATION

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Abstract. Gamification is a rather new method in education and unfortunately is not a widely known method among Hungarian primary school teachers in Romania. This paper presents the knowledge and opinion of pre-service preschool and primary school teachers about gamification and its use in education. In this study 81 Primary and Preschool Pedagogy students from Babeș-Bolyai University were participated, 80 of them were female and 1 male. 40 students are in first year and 41 in second year of their studies. The research was carried out during February-March 2020 at Babeș-Bolyai University, Romania. To get to know their point of view and knowledge about gamification, an online questionnaire was developed by the authors. The obtained data was quantitatively (closed questions) and qualitatively (open questions) analyzed. According to the results, half of the students think that there is no difference between gamification and game-based learning and for three quarter it is difficult to see the differences. This is surprising as students were taught about gamification before filling in the questionnaire. Students perceive a high level of utility of gamification in education. The most frequently mentioned benefits by the participants are that gamification motivates and actively involves students. Even if participants gave many advantages of integrating gamification in education, the biggest disadvantage is related with the time necessary for preparation of a gamified lesson and for the time-allocation during the lesson. As obstacles of using gamification, they mentioned the negative attitude or/and lack of methodological knowledge of some teachers and the constrains of the curriculum. Most of the pre-service teachers prefer both paper-pencil based and technology-aid gamification. They consider solving exercises the most suitable for gamification.

Keywords: gamification, pre-service preschool teachers, pre-service primary school teachers

1. Introduction

We live in a world of constant change, where we must constantly adapt to challenges if we want to keep pace with development. We will need more and more complex systems of skills to lead a successful life. The foundation and development of these ability systems and key competencies is the task of the current education, therefore it is essential to open to the new in the field of education as well.

Traditional teaching methods tend to have a fixed learning structure that in some way prevents the child's motivation, creativity, and innovative skills from developing. Students receive theoretical rather than practical instruction, which encourages them for memorizing knowledge instead of developing competencies. Thus, using innovative approaches that provide a better education is an effective way to address this issue. Gamification can be one such new opportunity for innovation.

To be widely spread, gamification must become familiar for teachers. The use of this method has many benefits, but without a strong methodological knowledge about the integration of this method in the classroom it could have also negative effects. The implementation of gamification has barriers, as

Received April 2021. Published online 8 July 2021.

Cite as: Opriș, E.-T.; Bálint-Svella, É. & Zsoldos-Marchis, I. (2021). Prospective preschool and primary school teachers' knowledge and opinion about gamification. *Acta Didactica Napocensia,* 14(1), 104-114, https://doi.org/10.24193/adn.14.1.8

lack of time for preparing the game, lack of methodological knowledge of the teachers, and lack of resources (Sánchez-Mena & Martí-Parreño, 2017).

Gamification is not a widely known method among Hungarian primary school teachers in Romania, only one third of the participants in the study driven by Hari and Zsoldos-Marchis (2020) heard about this method. Participants were given a short description of gamification, but one third of those who have already heard about gamification confused it with game-based learning.

In this paper a research among pre-service preschool and primary school teachers is presented about their knowledge and opinion on gamification.

2. Theoretical background

Gamification is a rather new method in education, it was previously used mainly in marketing. Deterding et al. (2011) defined it as "the use of game design elements in non-game contexts" (p. 10). There are also more detailed definitions, which also includes some goals of gamification. For example, the definition given by Kapp (2012), according to which gamification is "using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems" (p. 24), highlights the motivation and active involvement. The engaging in the learning and promoting problem solving characteristics of gamification is also highlighted by Su and Cheng (2015). Another approach for designing gamification is linking with computer-games, in this context gamification is the use of elements from computer games outside gaming activities (Prykhodchenko et al., 2020).

Gamification is not equal with game-based learning. According to Al-Azawi, Al-Faliti, and Al-Blushi (2016), gamification is turning the whole learning process into a game, and game-based learning is using a game as part of the learning process.

According to Fromann (2017), the advantage of gamification can be summarized along three performance-enhancing factors: increase level of individual and group motivation, strengthening the community cohesion, and increased academic achievement. Domínguez et al. (2012) highlights in their research that gamification have an important emotional and social impact on students as the reward systems and competitive social mechanisms are motivating them. Students participating in gamified courses said that their motivation increased (López Carrillo et al., 2019; Zsoldos-Marchis, 2020), the course attendance was higher (O'Donovan et al., 2013; Laskowski, 2014; Barata et al., 2017; Zsoldos-Marchis, 2020), and they worked harder on the tasks (De Byl, 2012; Laskowski, 2014; Zsoldos-Marchis, 2020).

However, in addition to the many positive effects, there are studies that also highlight its limitations. Hanus and Fox (2015) observed in their research that student's motivation decreased during the course, which was attributed to the long-term application of the method, which confirms that gamification is not necessarily effective when excessively used (Kapp, 2012). In the view of some researchers, gamification increase external motivation instead of internal motivation (Deci et al., 2001), which was also the opinion of the students participated in a gamified Mathematics course (Zsoldos-Marchis, 2020).

The implementation of gamification in education has some barriers, among which the main one is the time-needed for preparation of a gamified course and the time which gamification takes from the course schedule (Sánchez-Mena & Martí-Parreño, 2017).

Gamification is mostly used in higher education, especially with Computer Science related disciplines (De Byl, 2012; O'Donovan et al., 2013; Barata et al., 2013a; Barata et al., 2013b; Sillaots, 2014; Laskowski, 2014; Barata et al., 2017; Kovácsné Pusztai, 2021), but there are also examples for mathematics (Faghihi et al., 2014; Zsoldos-Marchis, 2020) or Sciences (López Carrillo et al., 2019). It is mostly implemented for evaluation and the acquisition of the points are monitored via an online platform. This could explain the fact that gamification is not frequently used in pre-university education. But it can be also used without technological aids (Kim, 2015; López Carrillo et al., 2019; Zsoldos-Marchis, 2020), so it can be adapted to younger students. Also, there is a view that specially

designed digital platforms make gamification more attractive, increase motivation and enhance the learning experience (Campillo-Ferrer, et al., 2020)

As the research presented in this paper focuses on pre-service preschool and primary school teachers, the literature was studied about the use of gamification in these group ages. Gamification is seldom used in preschool, but they are already some attempts. The found examples are using technological enhanced gamification for developing different competencies using gamification. Sudarmilah and Arbain (2019) have showed that the video game developed by them improved the general cognitive competence of preschool children. Ongoro and Mwangoka (2019) used a gamified quiz program for improving alphabetical sound articulation of preschoolers. Early childhood education is an important and fundamental stage of learning and has a high impact on the academic success. Thus, it is important to use efficient teaching methods. Gamification improves children's participation in the tasks (Weinhold, 2014; Zamuner et al., 2017), but the response time is slower, which could be explained by the distraction cause by using the computer (Weinhold, 2014). Gamification is also rarely used in primary school. Prykhodchenko et al. (2020) used gamification in form of a computer game to teach primary school teachers programing in Scratch.

3. Methodology

The research was carried out during February-March 2020 at Babeş-Bolyai University, Romania.

3.1. Research questions

This research tries to find the answers on the following questions:

1. Do pre-service preschool and primary school teachers know what is gamification?
2. Are pre-service preschool and primary school teachers aware about the difference between gamification and game-based learning?
3. Do pre-service preschool and primary school teachers consider use of gamification in education a good idea?
4. What are the benefits of using gamification in education in the view of pre-service preschool and primary school teachers?
5. What are the disadvantages of using gamification in education in the view of pre-service preschool and primary school teachers?
6. What are the obstacles to the use gamification in education in the view of pre-service preschool and primary school teachers?
7. How pre-service preschool and primary school teachers would integrate gamification in education?

3.2. Research instrument

To find the answers on the research questions, an online questionnaire was developed by the authors based on the scientific literature and previous surveys about gamification (Sánchez-Mena & Martí-Parreño, 2017; Pektaş & Kepceoğlu, 2019; Hari & Zsoldos-Marchis, 2020). This questionnaire contains 18 items, from which 4 are demographical questions and the remaining 14 items are designed to explore Primary and Preschool Pedagogy specialization students' knowledge about gamification and their attitude towards integration of gamification in education. From these thematic questions 9 are closed (multiple choice, checkbox, and 5-level Likert-scale type) and 5 are open questions.

3.3. Participants

In this study 81 Primary and Preschool Pedagogy students from Babeș-Bolyai University were participated, 80 of them female. 40 (58% of the respondents) students are in first year and 41 in second year of their studies.

The average age of the students is 19,93 years. Only 2 (2.47%) students are working beside their university studies. As regarding their residence, 46,91% are living in urban areas, 53,09% are living in rural areas.

3.4. Data collection and analysis

The participation was voluntarily. The data was collected during February-March 2020. Before filling in the questionnaire students had instruction about gamification. First year students attended a lecture about gamification. Second year students have studied about gamification and experienced gamification in two games designed in Seppo.

The obtained data was quantitatively (closed questions) and qualitatively (open questions) analyzed. For quantitative analysis frequencies and percentages were calculated. In case of the answers for the open questions categorial analyzis was performed.

4. Results and discussions

4.1. Students' knowledge about gamification

Before completing the questionnaire, first year students had a short presentation about gamification, second year students have also experienced gamification in two games designed in Seppo.

4.1.1. Definition of gamification

To find out what students know about gamification, they were asked to formulate what they understand by gamification. All students have given a description of gamification. 56,5% of the students stated simply, concretely the most common definition from the literature, that gamification is when we introduce elements of game in a non-game situation.

Other students have given some benefits of the gamification instead of definition. They think that gamification promotes easier understanding and learning. In their view gamification is goal oriented and implies a more active participation in learning processes, which respond more effectively to current educational interests.

37% of the students think the gamification attracts attention, motivates, entertains, develops creativity, relieves tension/stress; it is practical and child centered. Motivation refers to a mental or emotional state that triggers behavioral or psychological changes. It can be divided into two types: intrinsic and extrinsic motivation. Intrinsic motivation is a motivation type that can be caused by an individual's own pleasure, curiosity, or interest. Extrinsic motivation is influenced by environmental and external factors, such as rewards, pressure, or punishment (Ryan & Deci, 2000). Those in the second year who had experience with gamification, leaned towards intrinsic motivation, unlike those in the first year, who did not experience the method, only heard of it. Motivation is one of the most important factors that can influence the success of gamification (Sailer, Hense, Mandl, & Klevers, 2017).

4 (0,38%) students think is a problem-solving facilitation method. Gamification can be considered as problem solving activity with a playful attitude (Shell, 2008). 3 (0,28) students believe that we can achieve greater learning results with the help of gamification.

4.1.2. Difference between game-based learning and gamification

In order to see how deeply students understand gamification, they were asked if they observe any difference between game-based learning (GBL) and gamification. 46,9% of the respondents consider that there is no difference between GBL and gamification. There is no significant difference between the first year (47,5%) and second year (46,3%) group.

From the 53,1% of the respondents who stated that there is difference between GBL and gamification, only 26,9% really understand the difference between the two, they say that the difference is the way we use the game and what role it plays in the activity. Gamification is turning the learning process as a whole into a game, while GBL is using a game as part of the learning process. Where gamification involves a learning process and applies the principles of the game, GBL takes a game and uses it for learning. GBL aims to teach a discreet skill or a specific learning outcome, rather than being a complete pedagogical system. GBL, as well as gamification, also use mechanics, elements, and game thinking. The difference is that games-based learning turns a learning goal from an e-learning course into a game, while gamification takes over the entire e-learning process and turns it into a game (Al-Azawi et al., 2016).

Other explanations about the differences between game-based learning and gamification relates with highlighting some features of gamification, as it is more motivational (as a method), it focuses on problem solving, it is more complex, more stimulus rich, more interesting, more eye-catching, more organized and built on rules compared to game-based learning. Others say gamification makes it easier to check your knowledge, helps in the playful processing of the curriculum.

There is a significant difference between the answers given in the first respectively second year group. First year students answered this question with more difficulty, giving less specific, obvious answers.

4.2. Students' opinion about the benefits and role of gamification in education

Students were asked to give the perceived utility of gamification in education on a scale from 1 to 5. The average obtained was 4,69 with 0,55 standard deviation. There is no significant difference between the first year (M=4,68, SD=0,60) and second year (M=4,71, SD= 0.50) group. This positive attitude confirms the results obtained by Martí-Parreño, Seguí-Mas, and Seguí-Mas (2016).

Students were asked in an open question about the benefits of using gamification in education, their responses were very varied. Based on their most common answers, 4 categories were identified, subcategories were also assigned to each of them (Table 1). The categories in which the students' answers were grouped are the following: better learning experience, more effective learning, more motivated/active students, and the development of social skills and cooperation.

The most representative category is about motivating and actively involving students, 50 answers referred to this category. This is in concordance with a previous research of Hari and Zsoldos-Marchis (2020) among in-service primary school teachers. Motivation is seen as the most important benefits described by Pektaş and Kepceoğlu (2019) in case of pre-service teachers. The most mentioned benefit in this category is arousing interest/curiosity, given by 23 students. The motivating role of gamification was highlighted by 17 students: 12 second year and 5 first-year students. The emphasis on the motivating role of gamification is consistent with the statement of Fromann (2017) who argues that one of the advantages of gamification is to increase individual and group motivation. Also, gamification can be useful for learning, because it can promote students' involvement in activities, due to its fun and playful nature. Gamification can be a good solution to help solve the problems of involvement and participation of students in the classroom (Song & Burton, 2018).

The second most representative category refers to the effectiveness of the learning, as 31 of the students mentioned benefits from this category. In this category the most mentioned benefit is that gamification maintain attention, which was highlighted by 15 students: 13 first year and 2 second year students.

Table 1. Students' opinion about the benefits of gamification: categories and subcategories

	Categories	Subcategories	Number of answers	Number of answers for each category
Benefits of using gamification in education	Better learning experience	Learning by playing	7	20
		Experiential learning	3	
		Friendly/relaxed atmosphere	10	
	More effective learning	Easier task understanding	13	31
		Easier learning of the new material	3	
		Maintains attention	15	
	More motivated/ actively involved students	Motivating	17	50
		Arouses interest/curiosity	23	
		Activating/not monotonous	9	
		Strengthening the desire to perform	1	
	Development of social skills/cooperation skills	More introverted children are also involved	3	10
		Strengthening cooperation	3	
		Development of social skills	4	

As regarding the role of gamification, students had to select the 3 most important ones from a list. The most frequently selected role was that gamification diversifies the learning process (55 students). Students also think that gamification activates students (51 students), maintains learning motivation (50 students), helps to achieve the pedagogical goals (25 students), creates a relaxed atmosphere (17 students), helps the personality development (16 students), provides entertainment (16 students).

4.3. Students' opinion about the disadvantages and obstacles of integrating gamification in education

Students were asked in an open question about the disadvantages of using gamification in education. The most common responses, categorized, are summarized in Table 2.

Table 2. Students' opinion about the disadvantages of gamification: categories and subcategories

	Categories	Subcategories	Number of answers	Number of answers for each category
Disadvantages of using gamification in education	The game takes the place of the learning	Some students exaggerate the game	6	24
		The focus my shift from the learning content to the game	15	
		The focus may shift to the rewards	3	
	It is time consuming to organize and realize			21
	There are no disadvantages			7

Among the disadvantages of using gamification in education, 2 categories were identified: time-consuming and the game takes the place of the learning. Using gamification, the focus anyway is shifted from the learning to the game, and if this method is well implemented, this shift does not affect the learning. In some cases, it could happen that students exaggerate with the game. The time-consuming characteristic of gamification is the most mentioned disadvantage in the second year (15 responses) group, and the shift from learning to play is the most mentioned disadvantage in the first year (15 responses) group. This difference could be explained by the fact that second year students experimented gamification, first year students no. Experimenting gamification second year students have seen that they improved their learning results during the gamified exercises, so the focus on the game does not hinder learning.

The focus on the game instead of learning is also related to the problem of external and internal motivation. Werbach and Hunter (2012) warn that strong external motivators can reduce internal motivation. If persons regularly receive many kinds of rewards for the work they do, after a while it is no longer the work or the learning is important to them, but the accumulation of points, as control can be transferred from internal processes to external ones.

An open question asked participants about their opinion on obstacles/barriers of implementing gamification in education. The answers were qualitatively analyzed, categories and subcategories were identified. The most highlighted obstacles/barriers are summarized in Table 3.

Table 3. Students' opinion about the obstacles/barriers of gamification: categories and subcategories

	Categories	Subcategories	Number of answers	Number of answers for each category
Obstacles/barriers of using gamification in education	Educators' attitude is not positive	They are afraid that the focus will be on the game instead of learning	5	45
		They think, takes a lot of time/energy to plan and implement it.	37	
		Teachers are afraid that the method is not effective enough	3	
	The teachers are not prepared for using gamification in education	Educators' lack of creativity/lack of interest	14	24
		Too new method, teachers do not know it	10	
	The curriculum prevents its use	There is no time to use in the classroom.	13	15
		It cannot be used in all themes.	2	

The most frequently mentioned category is related with the attitude of the educators towards gamification. They are mostly blocked by their conviction that gamification is time consuming (37 answers), but they are also afraid that the focus will be mainly on the game (5 responses) or the method is not effective enough (3 responses). The time-consuming characteristic of gamification is also the most mentioned in case of a previous research among pre-service primary school teachers (Pektaş & Kepceoğlu, 2019) and in-service primary school teachers (Hari & Zsoldos-Marchis, 2020) or higher education teaching staff (Sánchez-Mena & Martí-Parreño, 2017).

The lack of preparedness of the teachers is mentioned by 24 answers, this category refers to their lack of creativity/interest (14 answers) or methodological knowledge (10 answers).

Survey participants also think that the number of children in a class is too large for implementing gamification, and class management problems can occur during the activity, as lack of discipline. These were mentioned by only 1-1 participants, so a separate category was not formulated for them.

4.4. Students' opinion about methodology of integrating gamification in education

Most of the participants (59 students – 72,84%) prefer both type of gamification. There is significant difference between the answers of the first-year students (80%) and the second-year students (65,85%). 17,5% of the first-year students and 24,39% of the second-year students prefers online gamification. The higher percentage in the second-year group can be explained by the experiences with Seppo online gamification portal.

More than half of the respondents consider that the exercises to be solved in class are the easiest to gamify (Table 4). Processing the new knowledge and gamifying the whole educational process obtained much lower percentages. It is interesting that there is a significant difference between the responses obtained by the first year (35%) and the second year (4,9%) group as regarding the easiness of gamifying the acquisition of new knowledge. This could be explained by the fact that the second-year group used gamification only for solving problems.

Table 4. What is easier to gamify (percentages)

	All participants	Responses by groups	
		1st year	2nd year
tasks given in a lesson	60,4%	52,5%	68,3%
the whole educational process	17,25%	12,5%	22%
the acquisition of the new knowledge	19,95	35%	4,9%
the evaluation	2,45%	0%	4,9%

In the view of the respondents, gamifying the tasks given in a lesson has the highest contribution for increasing learning outcomes (41,85%) – see Table 5. This result is similar with that obtained by Hari and Zsoldos-Marchis (2020), where 54,06% of the participant primary school teachers considered gamifying exercises with highest impact. There is a significant difference between the first year (32,5%) and second year (51,2%) group, which difference can be explained by the fact that the second-year group experiences gamified problem solving, and they have seen its benefit on their learning. A significant percentage of the students, about one quarter, consider gamifying the whole educational process and the acquisition of the new knowledge with high contribution to the learning outcomes.

Table 5. When gamification has the highest contribution for increasing learning outcomes (percentages)

	All participants	Responses by groups	
		1st year	2nd year
tasks given in a lesson	41,85%	32,5%	51,2%
the whole educational process	23,5%	25%	22%
the acquisition of the new knowledge	22,25%	25%	19,5%
the evaluation	12,34%	17,5%	7,3%

Most of the participants think that the gamification is most suitable for classroom activities for exercising (90,12%), and for arising students' interest towards the new knowledge (71,60%) – Table 6. In case of arising interest and acquisition of the new knowledge the percentage of the first-year group is higher, in case of exercising the percentage of the second-year group is higher.

Table 6. When is the most suitable to use gamification (percentages)

	All participants	Responses by groups	
		1st year	2nd year
During free-time activities	8,64	5%	12,2%
During the lesson, arising students' interest towards the new knowledge	71,60	80%	63,4%
for acquisition of the new knowledge	20,99	25%	17,1%
for exercising	90,12	82,5%	97,6%
for evaluation	13,58	12,5%	14,6%

Conclusions

This research focused on analyzing students' knowledge and opinions about gamification.

Seems, that it is difficult for students to understand what gamification is. A lecture on gamification was given for all the participants before filling in the questionnaire. According to the results, half of the students think that there is no difference between gamification and game-based learning, and for three quarters of them it is difficult to explain the differences.

Students perceive a high level of utility of gamification in education. The most frequently mentioned benefits by the participants are related with motivation and active involvement. Even if participants gave many advantages of integrating gamification in education, the biggest disadvantage seems to be the time necessary to prepare and to implement gamification. As obstacles of using gamification, they mentioned the negative attitude or/and lack of methodological knowledge of some teachers and the constrains of the curriculum.

As regarding the methodology of implementation, most of the pre-service teachers prefer both paper-pencil based and technology-aid gamification. They consider solving exercises the easiest to gamify. It is also suitable for arising students' interest towards the new knowledge.

The results highlight the necessity of training programs in gamification for pre-service and in-service teachers.

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