University of Gothenburg – Department of Education

Gamification in educational practices in schools

A literature review regarding teaching and learning practices using gamification in Latin America and Spain

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Introduction

The gamification became relevant with the popularization of the games. According to report *2021 Essential facts about the video game industry*, "nearly 227 million Americans play video games and 76% of American kids (under 18) are players" (ESA, 2021). In the Latin America there are 289 million of players and the games' market grew in countries, such as Mexico, Argentina, Brazil and Chile (NewZoo, 2021). According to the data from the Game Brazil Survey (PGB, 2022) 74.5% of the Brazilian population plays electronic games. The use of online games is also growing among children and teenagers in Spain and Portugal.

The games can potentialize the learning in some areas and there is a specific field applying games in the learning called Digital Game-Based Learning (DGBL). In this context, the gamification became very popular. The gamification consists of the use of game elements (mechanics, strategies, thoughts, among others) with the purpose of motivating individuals to action, assisting in problem-solving and promoting learning. Therefore, this paper aims to show a literature review about the theme gamification applied in the area of the education, specifically the teaching and learning carried out in elementary schools in Latin America, Spain, and Portugal.

Before properly defining gamification, it is important to identify what games are for human beings. Over the centuries, practically all known civilizations have been associated with some type of competition, that is important for the social structuring of the community to which they belong. For example, the Greeks had the Ancient Olympic Games and the Romans had the gladiator duels.

The historian Huizinga (2001) points out some benefits about the act of playing, such as: being a free or voluntary activity; having a delimitation of time and space; generating experiences or representing something for those who partake in a game; being an interval of daily life. The same author shows that the act of playing is beyond mere entertainment, but is inserted in various social relationships such as politics, work, poetry, among other cultural practices.

Deterting et al. (2011) identify the first use of gamification, in 2008, and it was widespread adoption in 2010. Moreover, the authors understand that gamification was "developed as an academic

concept" and it refers to "the use of game design elements in non-game contexts"(p. 2). The gamification presupposes the social use of the games and entails the application of elements traditionally found in them, such as narrative, feedbacks, rewards, conflicts, cooperation, competition, clear objectives and rules, level, trial and error, diversion, interaction, among others, in other activities, that are not directly associated with games, with the aim of trying to obtain the same degree of involvement and motivation, that we normally find in players when interacting with games (Deterting et al., 2011).

Prykhodchenko et al. recognize (2020) the gamification being used in some cases:

> to develop certain skills or behaviors; to visualize and emphasize activities and skills that are difficult to demonstrate using traditional techniques; to interest students, to create a kind of competition between them; to monitor students' progress (p. 2).

When we think about some elements of gamification (cooperation, interaction, rules, etc.) to develop certain skills or behavior in the students, we can associate such idea to some theories of learning and teaching. For example, the *behaviorism,* an attempt from teachers to produce some positives skills in the students or even motivate them (Skinner, 1968). But we can also identify in the gamification Vygostky's *sociocultural theory*, in which learning is constructed by the subject's interactions with other individuals in a historical and cultural environment (Vygostky, 1991). The idea of social life with rules and controls is compatible with the rules, goals, sometimes cooperation or competition found in games. It is possible to say that Papert's constructionism collaborates with the idea of developing problem solving that a gamified activity can provide students (Papert, 1993).

Method

A literature review is a way of evaluating and interpreting available research relevant to this area, identifying gaps in the current field of research, and providing a framework for properly positioning new research activities (Kitchenhan, 2004; Gilbert, 2006). Thus, the elaboration of the current review on gamification in education is justified by seeking to identify the important current research available on this topic.

The main characteristics of a review are the definitions of: explanation of the objectives; specific search strategies that aim to detect as much relevant literature as possible; documented search, so readers can assess accuracy and completeness; clarification of inclusion and exclusion criteria for evaluating each study; specification of the information to be obtained from each study (Kitchenhan, 2004, Gilbert, 2006).

Thus, the general objective of this review was to build a view of the studies that are being conducted on gamification applied to the area of education in elementary schools, specifically in Latin America, Portugal, and Spain. In addition, this review aims to answer the following questions:

1. Is gamification proposed as a strategy for teaching and learning processes in elementary school?
2. What are the difficulties and beneficial possibilities of inserting gamification in educational practices?
3. What are the elements of gamification found in the studies?

The electronic database relevant to the review was Gothenburg University library database. Then, through advanced searchs the choice of terms or keywords was made: gamification and elementary schools. In addition, it was selected to investigate all types of materials (journals, books, etc.), English language and materials published in the last two years. It was found 1148 materiais, but filtering with the "peer-reviewed articles option" the results were 825 items. So, the next step was to establish the inclusion and exclusion criteria for the articles found (Table 1).

Table 1

Criteria for inclusion and exclusion of articles

Inclusion criteria	Exclusion criteria
1. Works in the education field. 2. Strategy proposal for teaching and learning processes in elementary school through gamification. 3. Teaching and learning practices carried out in Latin America, Spain and Portugal.	1. Works that are not related to the research questions and objectives of this review. 2. Literature reviews and mapping of studies.

The first selection of articles took place through the evaluation of titles, abstracts and keywords, applying the criterion that the studies were works carried out in Latin America, Spain, and Portugal. In this first phase 110 articles were found it. Then, for the second selection (evaluating titles, abstracts, keywords) the criterion was applied that the research should be teaching and learning processes practices with gamification in elementary schools; in some works it was necessary to read the introduction and conclusion so that it was possible to clarify whether they would be included in the selection or not. A total of 76 surveys were selected it. Soon after, in the third selection, it was necessary to carry out a partial reading of the works (introduction, methodologies, conclusion) and a total of 32 studies was reached in this phase. In all selection stages, works that were not related to the research questions, literature reviews and mapping of studies were excluded in the process. In the following table (Table 2), there are 6 articles that have been chosen for examines closely.

Table 2

Overview of the Reviewed Articles

Article	Method and setting	Participants	Brief summary
Fernandez-Rio et al. (2020) Gamification and physical education. Viability and preliminary views from students and teachers.	Quantitative-qualitative study with: intervention programme based on gamification, questionnaire, and group discussion of teachers, and analysis of student's portfolio.	290 students (age between 6 and 14 years); fours teachers specialists in physical education	The study addresses the benefits of gamified activities in teaching physical education in Mexican schools.
Ferraz Júnior et al. (2020). Gamification based learning activities in elementary Brazilian public school.	Implementation of serious games and gamification workshops with teachers and students in Geography and Mathematic classes.	75 students (ages between 10 and 16); 78 teachers elementary and high schools.	The article discusses an implementation of serious games and gamification in Brazilian elementary and high schools.
López, P et al. (2021). Brazilian and Spanish Mathematics Teachers' Predispositions towards Gamification in STEAM Education.	Survey in Catalan language and Portuguese language. Likert-type questions and open-ended questions about profile and evaluation teacher's beliefs.	56 teachers who work with students from 10 to 16 years old.	The article discusses the opinions of Brazilian and Spanish teachers about STEAM and gamification applied in mathematics teaching.
Nascimento, L.M. et al. (2021). sBotics - Gamified Framework for Educational Robotics.	Production and application of a prototype platform. It was applicable for students from elementary schools who partake in Brazilian Robotics Olympiad.	204 students of elementary school, and from different parts of Brazil.	The article covers the production of a gamified framework for teaching robotics in Brazilian elementary schools.
Ricoy et al. (2022). Raising Ecological Awareness and Digital Literacy in Primary	Qualitative study in 3 educational centers. Instruments: teacher's e- diary,	156 subjects: 83 students, 68 parents and 5 teachers.	The study identifies gamified activities as strategies to create

School Children through Gamification.	students' e-diary, table charting, and questionnaries.		ecological awareness in elementary school students in Spain.
Ruiz-Bañuls et al. (2021). Gamification and transmedia in interdisciplinary contexts: A didactic intervention for the primary school classroom.	A quantitative-qualitative, survey-based, cross-sectional pretest and posttest experimental methodological design with experimental groups. and control group.	186 students at fifth year of primary education at a Spanish public centre.	The study approaches transmedia narrative based on the Avatar series to study curriculum subjects, such as: Spanish language, mathematics, natural sciences, and social sciences in Spain.

Results

The reviewed articles identified that gamification contributes to the teaching and learning process, but it alone does not replace the traditional form of education. The results reveal the possibilities and difficulties of applying the gamification strategy to educational processes in schools, as well as the game elements employed in the research examples analyzed.

Beneficial possibilities of gamification

Regarding of inserting gamification in educational practices, the studies shown the following *beneficial possibilities* in teaching and learning, subdivide in five categories: (1) improve skills or cause behaviour change; (2) engage and motivate students in activities in the classroom and in the learning environment; (3) improve the way of learning; (4) propose challenges to contribute to the teaching-learning process; and (5) promote mechanisms of socialization and group learning.

Improve skills or cause behavior change. All six articles reviewed point out that gamified activities with students improved skills of attention, creativity, problem-solving, initiative, commitment, autonomy, participation, interaction, and cooperation.

The studies of Ricoy et al. (2022) and López et al. (2021) identify the effects of the gamification in the students through analysis of teachers and student opinions, and also, student and teachers activities. Their finds reveals that participants demonstrated the improvement skills in their learning and changes in their behaviour.

The research of Ricoy et al. (2022) shows that through activities gamified the students internalize some valuable environmental habits or behaviours, such as waste recycling, and also, they

were stimulated about raising awareness about environmental protection. The same study shows that gamification contributed to the broad use of information and communication technologies (ICT), mobile devices, and the Internet. In addition, it generated respectful collaborative attitudes and problem-solving skills in the students. The authors stress that "children have strengthened their digital literacy [through games, reading, listening and managing content, etc.] process with the gamification processes used, with the environment as the focus of study" (p. 15). López et al. (2021) identify that the students had a significant development of critical and reflective thinking.

Ruiz-Bañuls et al. (2021) point out that gamification in the educative activities contribute to students to develop skills, such as: create empathy, to understand the meaning of new information, ask questions, make decisions, and draw conclusions that will help them to achieve expected learning objectives and outcomes.

Engage and motivate students in activities in the classroom. The reviewed articles of Ricoy et al. (2022), Lópes et al. (2021), Ruiz-Bañuls et al. (2021) and Fernandez-Rio (2020) shows that gamification elements increased learning motivation and engajament in school activities. Ferraz Júnior et al. (2020) stress that gamification it has been considered as a motivational method to engage the teachers and students' in-depth discussions, and also, it is a way for educators to get closer to the language and life of the students, who generally know and use the language of games in their daily lives. Fernandez-Rio et al. (2020) reveal that fun during a gamified activity can provide a high level of student participation and the gamification implemented on a long-term basis can create a sustainable motivation.

Propose challenges to contribute to the teaching and learning process. The study of Fernandez-Rio et al. (2020) show the importance of challenging goals in the physical education classes. In their research, the authors stress that students had several goals to achieve, included different difficulty levels to challenge them individually and in groups (i.e. learn body parts, learn how to pace oneself while running) and skills to master.

The study shows students earned points and badges as a way to motivate them to continue doing the proposed physical activities. In addition, the educators in the study made different tasks, from simple to hard, as a way to motivate students at the initial levels (being successful) and help them progress to more difficult tasks and levels.

Improve the way of learning. The reviewed articles reveal that gamified practices can improve ways of learning. The process of learning improvement can occur through self-study strategies, connection between the subjects studied, self-assessment, mastery of specific skills in a subject and application of what it was learned. For example, in the article of Ricoy et al. (2022) there is mention of a way to improve learning by applying ecological routines at school and in everyday life.

The studies identify gamification as a way to improve learning in the mastery of skills and competencies in specific subjects, such as mathematical competence (López et al., 2021), the understanding of block-based programming and elements of robotics (Nascimento et al., 2021), in a body awareness through physical activities (Fernandez-Rio et al., 2020), the awareness of environmental preservation in everyday life through ecological and recycling activities (Ricoy et al., 2022).

Ruiz-Bañuls et al. (2021) analyse that gamification strategies enrich the process of learning because it actively involves students and facilitates content interaction from curriculum of different areas, such as: Spanish language, mathematics, natural sciences, and social sciences. Fernandez-Rio et al. (2020) point out that students can develop self-regulated learning by deciding what skills and knowledge they want to obtain in their learning trajectory.

Promote mechanisms of socialization and group learning. The revised studies reveal that gamification promotes mechanisms of socialization and group learning. Ruiz-Bañuls et al. (2021) understand that the gamified context tends to create strong bonds between students, stimulates affective interaction factors, and enhances social skills. López et al. (2021) stress that students develop the ability to connect with students from a diverse background of theirs. The studies of Fernandez-Rio

et al. (2020) reveal that children develop social connection and cooperation in order to help each other accomplish individual and group tasks.

Difficulties of gamification

The *difficulties* present in the López et al. (2021) study is that gamification alone may not sustain students' interest and motivation in satisfaction levels. Besides, in Brazil specifically, the study point out that there is a reluctance from teaching staff or school management because of lack of resources and insecurity of teachers who don't have training in planning gamified activities. Fernandez-Rio et al. (2020) stress that teachers showed concern for the excessive workload of the new pedagogical approach.

Elements of games mechanisms

The use of *game mechanisms, dynamics*, and *component*s that appeared in the chosen studies were: challenges, feedback, badges, points, levels, ranking, narrative, and scenarios.

Table 3

Game elements found in the reviewed articles

Element	Description and mention in studies
Challenges	Tasks that require effort to solve them (individual or groups).
	Challenges that are possible for students to achieve (Fernandez-Rio et al., 2020).
Feedback	Information about the player's performance.
	The gamified framework for studying robotics provides realistic feedback to the students about robot's actions, such as sensor measurements (Nascimento et al., 2021).
	"Immediate feedback: students knew in advance how to successfully perform each activity, the number of points awarded for each task, and the level effectively achieved through an individual portfolio that acted as a guide and for record keeping" (Fernandez-Rio et al., 2020, p. 513).
Badges, Points	Benefits for certain achievements.
	"Badges for achievements: students could earn points to obtain several badges on each unit: healthy snack, personal tidiness, good individual behaviour, and good group behaviour " (Fernandez-Rio et al., 2020, p. 514).
	"The implementation of certain elements of games, such as levels, points, and badges, increases the time that the participants spend on the learning activity and helps to improve their predisposition to continue (Ruiz-Bañuls et al., 2021, p. 7).
Levels and Ranking	Player evolution. Ranking of players according to score.
	"The implementation of certain elements of games, such as levels, points, and badges, increases the time that the participants spend on the learning activity and helps to improve their predisposition to continue (Ruiz-Bañuls et al., 2021, p. 7).

Narrative	Consistent and continuous plot. Narrative capture students attention and helps signify content (López et al., 2021). Proposals involving play and transmedia technology as well as rich narratives and diverse environments promote the multiliteracy (Ruiz-Bañuls et al., 2021). The use of a powerful narrative such as the Marvel superhero universe (students have seen in movies, television series, and logos) can motivate and involve students to engage in physical education activities. In addition, children exercise their imaginations as they take on the roles of superheroes. (Fernandez-Rio et al., 2020, p. 514).
Scenarios	Representation of a world or location. There are many different scenarios presented to the students to simulate the educational robotics and tournaments (Nascimento et al. 2021).

Discussion

Remembering the proposed questions, (1) Is gamification proposed as a strategy for teaching and learning processes in elementary school?; (2) What are the difficulties and possibilities of inserting gamification in educational practices?; (3) What are the elements of gamification found in the studies? it can be said that this literature review has answered them.

The most of the papers reveal be empirical applications aimed at reflecting on the benefits of gamification techniques, the contribution to the teaching and learning process, student engagement, and the performance of individual and group activities. By reading and analyzing the articles the goal of gamified activities was to make the students more interested and developing the their creativity, interactivity, attention, creativity, problem-solving, initiative, commitment, autonomy, participation, interaction and cooperation.

Therefore, the studies present beneficial possibilities for inserting gamification into educational practices, subdived in five categories: (1) improve skills or cause behavior change (López et al., 2021; Ruiz-Bañuls et al.; Ricoy et al., 2022); (2) engage and motivate students in activities in the classroom and in the learning environment (Fernandez-Rio,2020; Ferraz Júnior et al. (2020); Lópes et al., 2021; Ruiz-Bañuls et al., 2021; Ricoy et al., 2022); (3) improve the way of learning (Fernandez-Rio et al., 2020; López et al., 2021; Nascimento et al., 2021; Ruiz-Bañuls et al., 2021; Ricoy et al., 2022) (4) propose challenges to contribute to the teaching-learning process (Fernandez-Rio et al., 2020); and (5)

promote mechanisms of socialization and group learning (Fernandez-Rio et al., 2020; López et al., 2021; Ruiz-Bañuls et al., 2021).

The studies satisfactorily expose some elements of gamification (Table 3), such as: challenges (Fernandez-Rio et al., 2020); feedback (Fernandez-Rio et al., 2020): badges, points (Fernandez-Rio et al., 2020; Ruiz-Bañuls et al., 2021); levels and ranking (Ruiz-Bañuls et al., 2021); narrative (Fernandez-Rio et al., 2020; López et al., 2021; Ruiz-Bañuls et al., 2021); and scenarios (Nascimento et al. 2021).

The difficulties found in the results show that gamification alone may not sustain student motivation, requiring a mediating teacher in pedagogical proposals (López et al., 2021). Teachers may feel reluctant to apply such a strategy because they are not trained enough, do not have the resources available, and feel overwhelmed by having to work with a new teaching strategy (Fernandez-Rio et al., 2020; López et al., 2021).

Overall, in my opinion, the studies presented provide a rather optimistic view of gamification, not taking into account complex factors involved in the educational process, such as the different levels of education and teaching careers, social political elements and ideological concepts that are linked to the application of learning strategies and methodologies in each regional and (inter)national context. The vision is in a way very instrumentalist, that is, educators are mere applicators of gamification techniques. In other words, educators do not participate in the decision making of the didactic strategies they will use in their classes. In some countries, such as Brazil, as shown in the review, certain issues related to the lack of resources available to educators may impact the non-adoption of some educational strategies.

In my opinion, it seems too pretentious to consider that only gamified activities can develop skills such as attention, creativity, initiative, commitment, autonomy, participation, among others, because the educational process and the development of skills will take years to develop in an individual. Without considering that the formation process of an individual does not occur only within the school environment, but also within the family, community, religion, etc. The constitution of an autonomous subject is a long process and life project.

It can be said that there is a mixture of learning theories concepts that underlie gamification. On the one hand, it can be observed, for example, that techniques such as feedbak, badges and rewards are used to motivate students to learn, and that behaviorist ideas are present, since students always need extrinsic motivation to learn. On the other hand, the idea of interactions between students and compliance with social rules specific to a given group leads us to consider the sociocultural theories. It is possible to say that the development of problem-solving skills in gamified activities meets the ideals of constructionism and constructivism.

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