

PAPER

Gamification and Game-Based Learning as Cooperative Learning Tools: A Systematic Review

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ABSTRACT

Innovation has changed teaching-learning processes; among the strategies that have been implemented are gamification and game-based learning, which are related to the use of games to generate spaces for participation. On the other hand, cooperative learning promotes scenarios of discussion, group work, and socialization. A systematic review is presented, following the PRISMA methodology. SCOPUS, WoS, and ERIC databases were used, and 20 articles published in the period from 2012 to 2021 were chosen. The results show that the cooperative model, gamification, and game-based learning allow the strengthening of academic, personal, and social skills in playful spaces that foster emotions and creativity. In-person, virtual, and blended activities, role-playing, and assignment to improve motivation are some of the options for the implementation of the model. Some applied tools are Scratch, Kahoot, Pandemic, Night of the Living Debt, Spoc, Minecraft, Scape Room, Cerebriti Edu, GaCoCo, Crazy Racket, and Keep Dancing. We conclude that the development of new learning environments allows students and teachers to work in groups and achieve the proposed objectives, with more participation, interaction, motivation, and inclusion.

KEYWORDS

cooperative learning, gamification, innovation, motivation, learning environment

1 INTRODUCTION

The methodologies used in the teaching-learning process have been transformed to respond to the educational community [1]. It is important to identify the needs related to thematic contents, assessment methods, and digital resources [2]. In this regard, the opinion, perceptions, and interests of the student promote new content such as group projects that strengthen decision-making [3].

Therefore, information and communication technologies (ICT) are a tool that is growing at a rapid pace and offers the possibility of enhancing the learning process [4]. Games and technology contribute to knowledge, participation, satisfaction, and acceptance by teachers and students [5,6]. Often, the game allows for

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generating scenarios where motivation, creativity, enjoyment, interest, well-being, autonomy, and competition are promoted [7,8]. They are developed in specific contexts, have a set of rules, serve for learning and training [9]. Additionally, at the educational level, they are used to achieve learning outcomes and academic aims through dynamic and innovative pedagogical practices [4,8]. In this perspective, in the present paper, we present two pedagogies related to the game in educational contexts: gamification and game-based learning [4,8].

Gamification has different definitions, and they change according to the context and the people [10]. In the educational field, it is defined as a strategy that uses elements designed for the game in non-game contexts [7,11,12,13,14,15].

It is interesting to consider that gamification has gained importance in the last decade because it allows game attributes such as adaptation, problem-solving, interaction, teamwork, rules, communication, and feedback [5] to be implemented in other scenarios [7].

Gamified environments are innovative and are becoming increasingly important in other disciplines such as marketing, management, health, and education [6]. It is a design process where game elements are included to positively influence people and improve processes [10].

In this sense, by using playful and enjoyable activities, motivating, meaningful, and non-conventional environments, commitment, interest, and participation are promoted. In addition, individual, cooperative, and collaborative skills are strengthened [16,17,18].

Likewise, game-based learning (GBL) encourages students to learn the content of the course while playing and completing games included to promote learning [19]. It is characterized by the exchange of knowledge in informal environments, participation in social activities, and the review of acquired knowledge, while participants play games. Consequently, teachers can see students' progress and make recommendations instantly [4,20].

Indeed, the game and all its features are used as an educational tool to make learning fun and enhance the educational content [21]. Games designed to improve thinking skills and for specific purposes are used. Serious games are the most common use of GBL [6], and the main dimensions are motivation, flow, and attitude [22].

Game-based learning and gamification are increasingly recognized in educational environments and have a greater impact on education because they are innovative technologies and include digital games to promote learning. Likewise, they have the same purpose, which is to motivate and improve student engagement [21].

In GBL, games are incorporated as part of the curriculum content to achieve specific objectives, and in gamification, game elements are used to be effective in the teaching and learning process [6].

These two learning techniques have positive effects on academic performance and psychological needs [22,23] and in some studies, they are combined to contribute to learning [8,24]. Thus, students participate in activities in which they must make decisions and solve problems [25]. This articulation between social and academic environments allows for teaching classes that promote engagement in tasks [15,22]. Therefore, the management of interpersonal relationships promotes a different kind of teaching that leads to the satisfaction of learning in a group. Parallel to this are incentives, competition, and commitment based on creative behavior [4,26,27].

It is interesting to consider the implications of video games and the human-computer relationship. For these reasons, it is important to delve into these tools and ludic phenomena [7]. Therefore, this study focuses on computer tools, digital platforms and digital games because they promote active learning of students. Thus, we will focus on reviewing the existing tools [6] in this article.

1.1 Elements that constitute gamification/game-based learning

For the learning process through the ludic activities, some elements are presented that consider the participant's background and motivations. Likewise, the needs and targets to be met should be identified [28].

The taxonomy of game attributes or components consists of evaluation, conflict, challenge, control, environment, rules, and goals [5,9]. Additionally, it includes immersion, fantasy, mystery, human interaction, player effort, adaptation, action language, sensory stimuli, location, games, quantifiable outcomes, and representation [23].

Some of these attributes relate to learning objectives and lead to cognitive, behavioral, and emotional gains. We consider that a committed student participates spontaneously while achieving educational and game goals.

In this regard, it is important to organize the classroom, establish ground rules, rewards and punishments, and present learning paths and options that are relevant to the decisions made by the students. In this way, students learn to see failure as an opportunity to start over and not as an option to abandon the game or study [2,18]. Indeed, the environment, progress, challenge, scenarios, systems, and game design, as well as leaderboards that influence participants' interest, are taken into account [10].

These examples serve as support so that researchers can use the elements to obtain results in the context for which they are designing the games.

Therefore, motivation becomes important because the behaviors of the participants are identified to provide options in their training process [16]. Intrinsic motivation promotes autonomy, self-realization, emotions, and sensations related to game processes that keep the learner connected all the time. Also, extrinsic motivations are related to external rewards provided by the proposal: rules, interactions, badges, challenges, points, and avatars. This is in addition to leaderboards, ranks, reputation, feedback, and everything that increases social status among participants [4,7,11,12].

Finally, the results obtained through the narrative experience, the characters, and the multimedia components should be considered. Furthermore, in the interactions with others, there is the feedback generated between the participants and the tutor, the collective construction of new knowledge, the cooperative work, as well as the emotional and academic perception [17,29]. Other game elements are avatars, three-dimensional environments, interfaces, ranks and levels, game designs, clear objectives, and limited resources [7].

1.2 Gamification, game-based learning, and cooperative learning in educational contexts

Game-based pedagogies as a methodological proposal in teaching-learning represent benefits for the student and the tutor [10]. Based on the teacher's perspective, better control of the activities can be obtained from this type of training, in addition to giving feedback an emotional twist [14].

This game-based methodology allows for establishing a process of cooperation, collaboration, and competitiveness that leads to the search for new options to face the challenge, hand in hand with the curricular design and the objectivity of the thematic content. At the same time, it contributes to the permanence of the student's interest [2,3]. It is important to take the students' wishes into account because this has repercussions on their participation and well-being [8].

From the student's perspective, one of the benefits is the development of skills and competencies in terms of problem solving, communication, cooperation, decision-making, new narratives, and lateral thinking, among others [5,25]. The dynamics used allow them to interact and take on challenges at different levels of complexity, strengthening their ability to handle challenging situations similar to those in a real context [18,29].

Therefore, at the cognitive level, the use of ICT allows improvements at the academic level through greater commitment, fun, and enjoyment in activities focused on the completion of a task. In this regard, student and group satisfaction levels increase [13,16].

Specifically, the game experience process should be based on the curricular design, the structure of a didactic project, and the different learning styles that have been contextualized, meaningful, and proposed; the way of learning depends on the latter. Likewise, it is perceived as useful for the achievement of the objectives proposed in the academic courses and, therefore, an increase in the knowledge acquired [12].

A key element in the training process of students in this type of teaching environment is cooperative learning with an interactive and collaborative approach to develop an activity that involves collective work with a critical sense from communication and relationship with others [30,31,32,33]. Cooperation serves to achieve common goals by working as a team. This involves interaction, mutual assistance and exchange of resources and ideas [34].

Cooperative learning has gained strength in recent years [35]. This methodology has become positioned as a tool applicable in any educational context, being seen as an active and innovative pedagogy [36], such as through the exchange of ideas and materials in small heterogeneous groups that share objectives aimed at the same purpose [37]. It is mediated by ICT and constructive communication, promotes autonomy, teamwork to achieve the same goal, responsibility, and cooperation [38,39].

In addition, cooperative learning considers the structure of the environment, individual differences, diversity, and the realities of the participants important so that spaces for co-creation can be generated. Thus, through social relationships, social inclusion, and emotional contexts conducive to open and constructive communication [40] are created. In recent years, there has been an increase in academic performance at an individual and collective level, acceptance among peers, and increased aspirations that favor competencies, processes, and skills through reflection, dialogue, and collaboration [41].

In cooperative learning, group members work towards the same goal, and interact with their peers [20]. In this way, the participation of all students is encouraged because they must assume responsibilities, talk, help each other, share tasks, and work together.

This fosters students' interdependence because when one student is successful, this has repercussions for the whole group, communication and leadership are improved, and everyone benefits.

Among the contributions is its versatility, which allows it to be applied in any environment and respond to the contextual diversity of the students. At the same time, it promotes useful skills for personal and professional development that take into account the individual as a social being, leaving aside egocentrism to focus on common goals, which leads members to share emotions in the face of success and failure [30,31]. Motivation and socio-cognitive skills become relevant in this process, as well as collective decision making, problem solving, and decentralization by teachers, since they empower students to work together [28,32]. Active student

participation is promoted; they work in small groups, help each other, and have a better understanding of the content of the courses [42].

It is highlighted that students and teachers can exchange ideas and experiences, and communication and interaction channels are improved [43]. Consequently, theory can be linked to practice, and added value is given to the educational community because spaces of positive interdependence are generated, social skills are promoted, and communication spaces are provided outside the classroom [35]. Indeed, higher academic performance, satisfaction, and improvements in the educational process are obtained [42]. They learn to help each other, share resources, and be creative, critical, and flexible [35].

In this sense, several systematic reviews have been conducted in recent years regarding gamification and game-based learning, which shows that it is a topic of interest. Dahalan et al., [6] conducted a review on vocational education and training and found that most research is in the fields of engineering and health. Thus, a variety of emerging technologies, such as immersive reality, browser games, and serious games, are included, making them beneficial at all educational levels.

In this regard, Guan et al., [44] made a systematic review of 35 experimental studies on the application of game-based learning in primary education. Most of the studies employed self-designed online games and took cognitive improvements into account.

Riar et al., [34] carried out a review and a future agenda on gamification and cooperative environments, in which they state the need for research on the relationship between games and cooperation because it is a topic that has been studied for a short time. Among the 21 studies identified, it stands out that the most used elements were challenges, missions, and tasks. In addition, they suggest that levels and points motivate people and provide positive feedback for cooperation. Specifically, Grande-Prado et al., [24] based their systematic review of the literature on 21 articles from Iberoamerica, where they propose that gamification and GBL are platforms to promote cooperative learning.

Krath et al., [45] conducted a systematic meta-review on gamification, serious games, and GBL research and the theoretical underpinnings on motivation theories and intervention design and implementation. Likewise, they present social gamification and expose how it connects participants to support each other and work towards a goal. In this perspective, Fernández-Río et al., [35] made a systematic review of cooperative learning and its association with prospective teachers. Nineteen eligible articles were included, and the authors highlight that thanks to this strategy, social, interpersonal, and transversal skills are improved. Also, these improvements are not linear, and require the development of structured experiences.

In this regard, there is a paucity of studies related to cooperative learning, which evidences the importance of this study. In addition, this review is justified in order to advance in this topic, especially with computer-based tools taking into account the digital era and the exponential development of apps and digital interactions. It is necessary to implement strategies and have tools to respond to changes in society. Also, it is important to promote academic spaces that foster teamwork and collaborative environments where students feel motivated and can strengthen their personal skills.

It is interesting to consider the implications of video games and the human-computer relationship. For these reasons, it is important to delve into these tools and the gameful phenomena [7]. This study focuses on computer-based tools because they promote students' active learning. Currently, digital platforms, digital games, and the computer-human relationship are promising. Therefore, we will focus in this article on reviewing the existing tools [6].

The aim of this research is to synthesize the contributions of the implementation of computer-based gamified/game-based cooperative learning in educational settings considering the purpose, population, modality and results of the interventions.

2 METHOD

However, we invite you to read carefully the brief description below. We present our analysis steps using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [46,47] in order to make a statement of the scientific production. Accordingly, we identified the following research questions: What is the geographical distribution and evolution of the studies over the years? What are the computer-based gamified/game-based cooperative learning tools and contributions?

Observing the procedure and search strategies, the literature from 2012 to 2021 was consulted, and we selected the Web of Science (WoS) and Scopus databases, which have the journals with the greatest impact at the scientific level, as well as a database in the educational field, the Resources Information Center (ERIC). The search was carried out during the months of December 2021 to February 2022.

2.1 Search strategy

For the search and selection of articles, the search terms were combined: “gamification”, “learning based on games”, “cooperative learning” and the Boolean operators AND/OR were used. The search fields were title, abstract, or keywords. The search equations implemented in the English language were the following (“Gamification” OR “Game-Based Learning”) AND “Cooperative Learning”.

For the paper selection method, the following inclusion criteria were taken into account:

- Gamification tool.
- Research at any educational stage (primary, high school, university).
- The text is published in English or Spanish.
- Journals with quality indicators and reviewed by academic peers.
- Articles published between 2012 and 2021 (both included).

To determine which studies should be excluded due to irrelevance, the criteria were

- Lack of access to the full publication.
- Studies not related to the subject of study.
- Publications of congresses, seminars, conferences, degree projects, or doctoral thesis.
- Research that has not gone through a peer review process.

2.2 Procedure for the selection of studies

During the initial process of the systematic literature review, 311 records were identified: 38 documents in WoS, 73 in Scopus, and 200 in ERIC; then 64 duplicate papers were eliminated. A total of 268 remained, which were analyzed independently by the

three authors in an Excel spreadsheet, taking into account the inclusion and exclusion criteria for screening the results. In cases where there was disagreement, a subsequent review was made to determine if the work was accepted by majority decision.

After carefully reading the abstracts of the selected articles, 47 documents were considered for a detailed reading of the full text, taking into account the inclusion and exclusion criteria to obtain the articles related to the objectives of the study. The final sample consisted of 20 documents that met the criteria established for detailed review and analysis. A flow diagram (Figure 1) shows how the screening process resulted in the final sample.

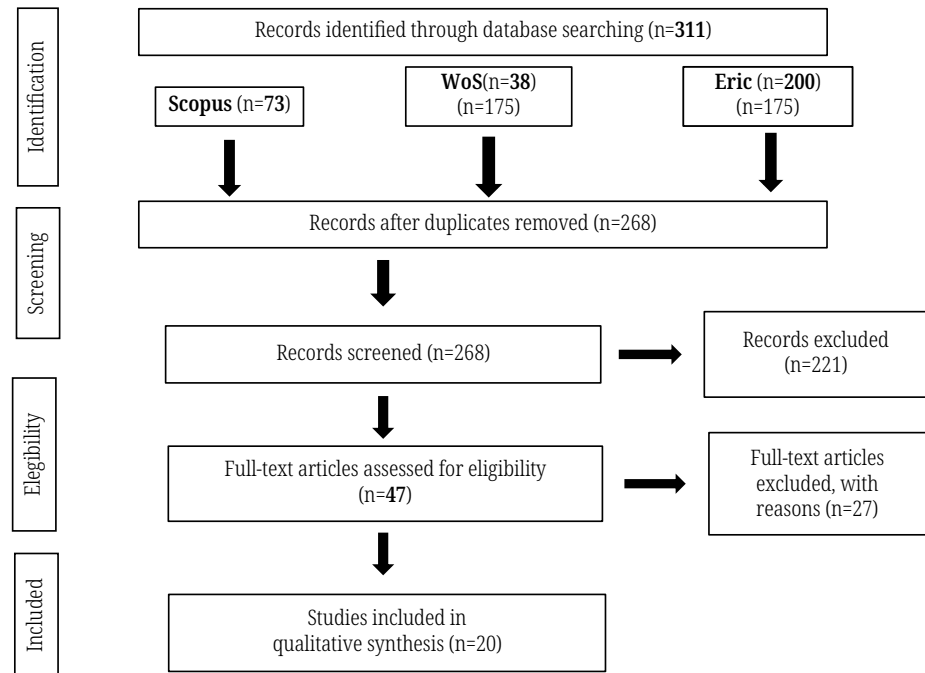


Fig. 1. PRISMA flow diagram of identified studies

3 RESULTS

In this section, we present the results obtained from the 20 articles that present the tools of computer-based gamified/game-based cooperative learning implemented in cooperative learning.

3.1 Analysis of scientific production

Observing the 33 studies analyzed, the evolution of scientific production reflects an upward growth in publications, with 2019, 2020 and 2021 being the years with the highest production, with 70% of the total articles. In this regard, the progressive and sustained increase in research on gamification, GBL, and cooperative learning draws attention.

Table 1 provides the affiliation of the authors. In 7 countries, the 20 studies that make up this systematic review were carried out. Most of the research comes from Spain (N=11), which is the country where more than half of the studies on this topic are produced, followed by the United States (N=3) and Italy (N=2).

Table 1. Geographical distribution of the study sample

Country	No. of Studies	Percentage
Spain	11	55%
USA	3	15%
Italy	2	10%
Bangladesh	1	5%
Finland	1	5%
Taiwan	1	5%
Turkey	1	5%

3.2 Contributions of the implementation of gamification/GBL and cooperative learning in educational environments

Our findings from the analysis show a diversity of elements that intervene in educational environments: use of technological resources (n:14;70%), incorporation of games, rewards, and challenges (n:13;65%), playful elements that lead to commitment and recognition of the other (n:12;60%), cognitive processes such as argumentation, reasoning and conceptual relationship (n:10;50%), learning based on problems and real situations (n:9;45%), emotions that generate connection (n:7;35%) and construction from educational environments that encourage creativity (n:6;30%).

Several scholars suggest that playful environments include the introduction of games in educational contexts through scoring systems, rewards, challenges, etc. [48,49]. Arguably, the aim is to promote spaces where students develop and strengthen their social and personal skills such as cohesion and creativity. Likewise, the objective is to learn in a fun way [15].

Additionally, students are allowed to strengthen knowledge through playful elements in a fun environment that leads them to engage and improve their performance [50,51,52,53]. Thus, the ability to perform simulated processes is stimulated [54,55,56].

Other studies have reported that by fostering emotions in participants, they engage in improved skills to change their behaviors [55,57]. Indeed, learning is achieved in a creative and active way, by generating the ability to synthesize what has been learnt in a playful environment [58]. Gamification and GBL make it possible to achieve meaningful learning and develop cooperative environments [21].

Consequently, it is necessary to involve the course materials and the content of the game. For that reason, the connection between theory and practice must be allowed. The environment must ensure that students are not only in a classroom or in front of a computer but also that there is an entertaining method of instruction that uses fun activities to work on skills and competencies [15].

Furthermore, a game-related pedagogy is supported by tools such as Cerebriti, Kahoot and other apps that allow exploring possible resources, the combination of ICT and educational games, to make the teaching-learning process interesting [52,59]. In this perspective, the use of game-based strategies allows working in educational and social settings [48].

As part of the studies selected in this systematic review, there are some virtual tools to promote teamwork and earn badges and prizes. These are the Econplus Champions League [53], the Night of Living Debt [59], Teams Games Tournament [60],

the Scape Virtual Room program [15], the Small Private Online Course (SPOC), and Minecraft as a platform for the comparison of cooperative vs. collaborative learning.

3.3 Gamification/GBL tools based on cooperative learning

Indeed, in the educational context where the studies were developed, four categories are presented (primary, high school, university, and teachers). Of the 20 selected articles, most of the studies were carried out with university students (n: 8; 40%), 20% focused on the formulation of an application, 15% on elementary school students, 15% on high school students, and 10% had teachers as a population.

There are tools aimed at primary school students who seek the consolidation and appropriation of curricular topics, the evaluation of commitment, the evolution of performance during the activities, and the identification of their perceptions of motivation and fluency. Hence, autonomy and cooperative work skills among equals are developed [15,51,55,58,61].

Regarding the work that was carried out with the population of high school, this is oriented toward the development of decision-making, cooperation, social and interpersonal skills, work roles, being able to reinforce knowledge for the presentation of higher education tests, and the perception of students in front of collaborative versus cooperative games [48,58,60,62,63,64].

Specifically, in higher education, we found studies focused on the use of technology, interaction to value cooperative work with common tasks, role assignment, and leadership to encourage [51,52,53]. The last population identified in this systematization was teachers. For them, a perspective focused on case studies and the identification of their perceptions regarding the application of dynamics related to gamified/GBL and cooperative learning was proposed as part of an exploration of inclusive methodologies in the classroom [56].

The results of the analysis show that the tools were applied through three modalities, the majority virtually (55%), followed by face-to-face (25%) and finally hybrid (20%).

Additionally, as part of the virtual application tools, among the proposals are a mobile application for language learning called Baicizhan [51], Scratch, as a visual programming language [60], a prototype of a game design [50], the OPPUMAEOL tool that allows knowing the opinion and perception about the use of active methodologies in education [55], the Virtual Trivia, the Smart digital whiteboard, the native software, and the Notebook program [48] and the already known Cerebriti Edu and Kahoot [57].

Among the tools for application in the face-to-face modality, it is assumed that the combination of experiences with game elements leads to greater motivation, commitment to the task, and performance results [51]. Esch & Wiggen [63], created Z-Man's Pandemic® Games, a cooperative board game, and Ozturk & Korkmaz [55], propose three tools to use in the classroom: 'I'll shoot a basket and get the score', 'Crazy Racket' and 'Keep Dancing'. Furthermore, Gennari et al., [50] recommend GaCoCo and Murillo-Zamorano et al., [53] the Jigsaw classroom approach.

As part of the hybrid application tools, some were identified that can be applied both in virtual and in face-to-face environments, such as interaction games between peers [53]; hybridization between adventure education, cooperative learning, and gamification [63] and flipped learning: the 4D_FLIPPED classroom [52].

However, regardless of the modality, strategies should put students at the center, making use of not only methodological but also affective strategies that promote

respect, solidarity, dialogue, and inclusion [64]. In addition, effective classroom management allows the establishment of roles and responsibilities.

We present the common findings that were identified, which were oriented toward the development of personal and group skills. Indeed, during the methodological processes used, students interacted, enhancing leadership, communication, self-learning, and decision-making skills, among others. The most relevant are presented below:

- The methodology used in tools such as Z-Man's Pandemic® Games, Small Private Online Course (SPOC) and Virtual Trivia are perceived as entertaining, enjoyable, effective and meaningful for working on students' skills [15,63].
- Teamwork is one of the most notable results of this research, since it promotes synchronous work among students through play and commitment. Hence, skills such as communication, participation, and motivation to achieve group goals are developed. This is evidenced in the results of the tools used, such as Z-Man's Pandemic® Games, 4D FLIPPED, Jigsaw classroom, hybridization between Adventure Education (EA), Cooperative Learning (AC) and Gamification, Cerebriti Edu, Kahoot, Scratch, Gamified with Learning Cooperative (GaCoCo), Crazy Racket, Keep Dancing, and Night of the Living Debt, Baicizhan [50,52,54,55,58,59,60,61,64].

Finally, one of the results that incentivizes the use of these gamified and cooperative learning tools, such as Crazy Racket and Keep Dancing, Teams-Games-Tournament, Online Course (SPOC), Gamified CO Design with Cooperative Learning (GaCoCo), Cerebriti Edu, and Kahoot, is the contribution it makes to the improvement of academic results as well as personal and social skills [15,50,53,55,58,60].

Based on the above, Table 2 summarizes the gamification tools implemented as well as the purpose, sample, and results obtained.

Table 2. Gamification tools implemented

Authors	Gamification Tool	Purpose of the Tool	Sample	Results
Manzano-León et al., [15]	Small Private Online Course (SPOC) with a gamification system.	Evaluate the perceptions of fluency, teamwork, and cooperative learning, with the use of Virtual Scape Room, locks, puzzles, and secret codes.	450 university students	Gamification is an educational strategy that enhances students' learning, skills, and competencies for behavior regulation and cooperative work.
Lamoneda et al., [64]	Technological tools, QR reading, and urban spaces for teamwork from Adventure Education.	Cooperative work, rewards, and challenges come from the hybrid model of cooperative learning, adventure education and gamification.	Not applicable	Innovative proposal that adapts the regulations in the school context, for the development of social and interpersonal skills, work roles, the reward system, and new technologies in self-evaluation.
Vergara & Mosquera [48]	A serious virtual game based on the traditional Trivial Pursuit environment, the design base is the Smart digital whiteboard and native software, the Notebook® program (version 10 or higher).	Provide tools to present the University Studies Access Test (PAEU), to identify favorable and weak points of previous knowledge.	70 second-year high school students.	This game reinforces and enriches the content of the class in a more enjoyable way than the traditional one.

(Continued)

Table 2. Gamification tools implemented (*Continued*)

Authors	Gamification Tool	Purpose of the Tool	Sample	Results
Gennari et al., [51]	A prototype of an initial game design, working in 3 stages (pre-design, design, and post-design).	Include gamified elements that can be designed to support and create specific strategies, rules, and roles.	19 primary school children and 2 teachers.	The rewards allowed to capture the attention. As well as increase interest, participation, and assessment of learning.
Carrion [58]	Cerebriti and Kahoot: didactic strategies for teaching content.	Identifies the effectiveness of the methodology applied from cooperative learning and gamification in the classroom, as well as the measurement of the degree of satisfaction.	Not applicable	Gamified tools that contribute to improving learning and evaluation results.
Gennari et al., [50]	Gacoco—Participatory game based on progressive and cooperative missions.	Evaluate engagement and progression in participatory game design.	35 primary school children	Challenges and cooperative work contribute to the quality and design of the products. As well as to the participation of students with little interest.
Quevedo & Zapatera [61]	Scratch is a tool for teaching computational thinking.	Study the Scratch programming language as a didactic tool to teach functions. The suitability of different methodologies was analyzed.	30 university students from the Faculty of Education.	Motivation for teamwork, communication, interaction, cooperation, commitment, responsibility, and leadership is encouraged.
Garcia & Hernandez [55]	OPPUMAEOOL: measurement tool. A comparative study was conducted on the use of the following methodologies: Kolb's Cycle, Flipped Classroom, Cooperative Learning, PBL and Gamification.	It determines the use of active methodologies by teachers and the analysis of data on the knowledge and use of different methodological approaches.	159 early childhood and elementary school teachers.	Teachers with less time in education use gamification as a teaching method.
Orozco & Morina [65]	Pinchers, Classcraft, StoryBird, and Firclass. Cooperative, outdoor, and directed board games.	Explore the inclusive methodologies put into practice by teachers, used in some stages of education.	70 early childhood, primary, and secondary school teachers.	Teachers implement digital games as a methodological strategy to improve family relationships, take tests, correct assignments, and achieve cooperative learning in inclusive environments.
Jong et al., [54]	A peer interaction game.	Interaction between peers, the assignment of different roles, and the effects of the use of cooperative abilities in the game.	128 university students from the Computer and Information Engineering Department.	Cooperative learning based on gamification is more effective than traditional learning, improving motivation and stimulation to generate active learning.
Baek & Tuati [62]	Minecraft	Compare gaming attitudes, feelings towards group work, and achievement in cooperative versus collaborative digital game-based learning environments.	164 students in the sixth grade of primary school.	Positive gaming attitudes are evident in cooperative conditions. Positive feelings towards group work are shown. Likewise, better academic results are observed in cooperative conditions.

(Continued)

Table 2. Gamification tools implemented (*Continued*)

Authors	Gamification Tool	Purpose of the Tool	Sample	Results
García-Tuduela et al., [49]	Game Based Learning (ABJ), in an educational escape room.	Benefit from the interaction among students to guarantee inclusion in educational settings.	Not applicable.	Challenges are fundamental for cooperation, as well as developing a strategy of inclusion, to favor the exchange of opinions, leadership, and affective relationships. This encourages creative thinking and active participation.
Ozturk & Korkmaz [55]	I'll shoot a basket and get the score.	Identifies the influence of gamification on academic success, attitude toward the course, and cooperative learning skills.	60 high school students.	The use of gamification contributes to students' attitudes, cooperative work skills, and academic performance compared to the traditional method.
Onecha et al., [66]	Game based on the Escape Room technique.	Promote reasoning and argumentation, for the interrelation of different concepts, placing them in the context of a global vision.	500 university architecture students.	A favorable attitude and interest towards the test is promoted, which fosters emotions that help to strengthen the memory of the specific content and the teacher's participation in the explanation of the game and the rules.
Dindar et al., [52]	Baicizhan and evaluated from the SIT perspective.	Gamified cooperation and competition in terms of effort, learning achievements, and interest in the task.	75 university students.	Gamified cooperation is more effective than competition in terms of developing feelings of belonging and attachment among learners because it facilitates positive social interactions and constructive communication.
Murillo-Zamorano et al., [53]	Flipped learning: the 4D_FLIPPED classroom Puzzle classroom with the Econplus Champions League rubric	Generalize this learning configuration to other university contexts, for the development of active and satisfying environments with potential for the acquisition of academic standards and the development of skills for the world of work.	132 university students of the Bachelor's Degree in Business Administration and Management.	It promotes the ability to work in groups, listen, learn for oneself, apply knowledge, and have the capacity for analysis and synthesis of information through an educational tool capable of satisfying the interests of the digital society.
Vázquez-Vílchez et al., [57]	Educational board game related to global change.	Create, validate, implement, and evaluate a board game, to identify its influence on learning and cooperation.	6 students of the Master Degree in Secondary Education and 128 students of the Bachelor's Degree in Primary Education.	It generates a sense of satisfaction after solving difficult tasks when the goal of the game is achieved, which involves overcoming challenges and encourages cooperative learning.
Erickson & Sammons-Lohse., [59]	Night of the Living Debt—Educational video game with competitive or cooperative social structure.	To identify if there is a significant difference in performance, participation and attitude according to four experimental conditions.	180 adults from a university extension program.	The educational outcomes of video game use are not modified by social context when precise definitions of competence and cooperation are used.
Esch & Wiggen., [63]	Pandemic® cooperative board game to teach management.	Encourage decision making through play, learn to reflect and put leadership theories and goal setting into practice.	Not applicable.	It generates reflection based on the metaphor on how to fulfill various roles in a work environment to promote cooperative work, leadership.

4 DISCUSSION AND CONCLUSIONS

A systematic review of the existing literature on gamification and cooperative learning has been developed, covering the period from 2012 to 2021 (inclusive). This review shows a progressive increase in articles, demonstrating a growing interest in this topic.

The contribution of the selected studies provides a space for discussion based on the two purposes of the study: to synthesize the contributions of the implementation of gamification and cooperative learning in educational environments and to expose the main tools, taking into account the purpose, population, modality, and the results of the interventions.

Related to cooperative learning, it is highlighted that students develop skills focused on achieving common goals, as well as strengthening communication, interaction, socialization, cooperation, commitment, responsibility, and leadership [34,49,52,62]. Therefore, they are motivated to participate and design higher quality products that take into account different constructive, creative, divergent, personalized, and globalized methodologies. In this way, it contributes to the appropriation of curriculum contents in order to maximize academic results, as well as the participation of the teacher as a process guide [60,66].

The tools used in this methodology offer the possibility of applying them in the classroom to guide students toward meaningful learning [53]. Likewise, it is important to improve attitude, performance, analytical skills, reflection, and constructive communication, as well as to apply theoretical knowledge in real situations [55,63]. Gamification and GBL have the ability to engage people in cooperative tasks because students are motivated by an active, engaging, interactive, and effective learning experience.

Additionally, it is proposed that these tools contribute to innovation in education by incorporating a creative way of teaching that allows teamwork and interaction among students [61]. Indeed, these teaching processes encourage students to be active, participatory, and affective with each other, this is considered from a learning perspective as a fun and engaging process in virtual, face-to-face, and hybrid environments [48,56]. Thus, educators have a reflective role and seek that students act as co-learners, and cooperation, academic motivation, and the acquisition of curricular and personal competencies are promoted through classroom management and evaluation [55,64].

In this perspective, these studies demonstrated that this hybridization between games and cooperative learning environments is a successful tool for interaction [58]. Social skills and competitiveness are factors that encourage participation, since students are more motivated when faced with these dynamics [4,65].

These contributions provided a positive contribution to the improvement of interpersonal relationships, following instructions and planning, based on clear rules, identified roles, and strategies that guarantee the achievement of different goals [49], which allows social development, without limiting factors such as age or subject matter [52].

Gamified/GBL learning brings contributions on a social level because, as students learn to solve problems, behavior change is generated. They fulfill non-game purposes and participate in engaging and exciting experiences. Therefore, it improves citizen participation, promotes innovation, improves interactivity, and transforms learning into a joyful, fun, and attractive experience [23].

The results illustrate how the merit of gamification and GBL concerning cooperative learning is that teamwork, social interaction, reflection, feedback, and

commitment are promoted [23]. Cooperative actions allow students to respect each other and accept each other's opinions [19]. In this regard, teachers must promote quality teaching through digital innovations to promote different learning where classroom tasks are a challenge and everyone's interests are taken into account, unlike traditional teaching styles.

Cooperation based on the construction of shared knowledge promotes a dynamic of mutual support. Students become aware of their responsibilities and skills and interact face to face [24].

It is important to note that the literature shows cooperation, game-based learning, and gamification as teaching methodologies that promote student interest, academic performance and have a positive effect on the learning process.

For these reasons, it is important to consider that the game increases the degree of satisfaction since it is usually attractive and challenging, with cooperative dynamics and strategies that contribute to having specific purposes. In addition, it is essential to comply with rules and set achievable goals [60,65]. This is related to some cognitive processes such as argumentation, reasoning, conceptual relationships, and task orientation [58,64]. The hybridization of these methodologies promotes new interactive and innovative learning spaces. Thus, the game is a strategy that can be integrated with cooperative learning.

Consequently, there is a positive result when working in groups because they learn from common objectives, generate organization and planning, being coherent with the methodology based on constructivism [50]. This type of dynamic allows for peer recognition so that they can learn with and from others [15].

Right now, game-based learning takes many forms, including virtual reality, face-to-face activities, role-playing, homework, and interest-activating exercises [54]. Besides, the effectiveness of the cooperative and playful methodology makes it an alternative about training potential, since not only is learning more, but it is also of higher quality [19,58].

This study has some limitations. First, there is a diversity of proposals regarding the implementation of cooperation and gamification. In this regard, there is a lack of clarity about the stages that should be developed during the implementation of these methodologies. Second, it is conceptual because, in some studies, cooperation, collaboration, and competition are presented as synonyms. Third, it is related to the selection of databases since gray literature is not included.

For instance, this systematic review shows the progress that has been made in the research line of playful proposals at the educational level as well as the tools that have been used for the development of new environments that arouse the interest of students in their training and allow them to feel as part of a team and work towards shared objectives with satisfaction and motivation.

Also, we conclude that the development of individual and group skills is favored to achieve common objectives and increase educational commitment; this occurs in a learning environment that allows the development of social skills, the use of strategies that increase participation, the exchange of information, and communication. Also, cooperating with others strengthens social ties within the group.

Learning achievement must be theoretical, practical, and inclusive because the game is a strategy that favors cooperation, motivation, participation, academic performance, learning, and personal skills. Fun and pleasant experiences are generated to learn from each other and provide happiness, competitiveness, a decisive attitude, and team spirit. From this perspective, this type of learning environment applies to all educational populations, whether in virtual or face-to-face mode, which allows its adaptation to inclusive classrooms.

Until now, the results obtained have served as input for identifying key elements in the training process, that is, components that teachers will find for the structure of a methodology. Arguably, the characteristics of the students must be identified, the objectives to be met, the competencies to be developed, and the skills to be strengthened during the learning process, to achieve compliance with the academic and personal development component.

Therefore, future research should focus on developing instruments that incorporate elements for applying gamification and game-based learning under a cooperative learning model that can be used to understand the aspects to be implemented, such as the creation, revision, evaluation, and feedback of activities. It is important to note that by clearly defining the objectives of each intervention, it is not possible to make the mistake of making a game that does not have a defined scope and a previous organization that achieves significant progress in the teaching process.

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