Application of gamification in Early Childhood Education and Primary Education: thematic analysis

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Abstract. In recent years, interest in the application of gamification in education has increased. Gamification is intended to stimulate students’ thinking through game techniques, involving them in problem solving. The main aim of this study is to implement a thematic analysis on the use of gamification in early childhood and primary students. To this end, a systematic review was conducted using the PRISMA model in the Web of Science database, following inclusion and exclusion criteria on quantitative and qualitative experimental and quasi-experimental studies that explore gamification in early childhood education and primary school. 24 studies were analyzed. The results show that the investigations are aimed at improving academic and collaborative skills and increasing motivation with positive results. Furthermore, most of the studies involve students between 10 and 12 years of age and are developed in science subjects supported by technological applications and gamified elements. In conclusion, it has been found that gamification has been applied in early childhood and primary education for many areas and objectives. Likewise, as a didactic strategy, it has brought significant improvements in academic performance, motivation and autonomy, which makes it advisable to continue deepening its application.

Keywords: gamification, early childhood education, primary education, thematic analysis

Introduction

This is followed by the scientific background and concludes with the purpose of the study and the research questions.

Conceptualization of gamification

In recent years, there has been a rapid growth in scientific production in the area of educational gamification (Swacha, 2021). In this sense, different research has been developed in different educational stages such as Primary Education (García Ordóñez & Fernández Lorenzo, 2022; Rodríguez Martín et al., 2022), Compulsory Secondary Education (Cenizo Benjumea et al., 2022; Moreno-Guerrero et al., 2022; Quintero González et al., 2018; Real-Pérez et al., 2021; Sánchez Silva et al., 2021) and University Education (Campillo-Ferrer et al., 2020). For this reason, it is being introduced in the training of future teachers at different stages (Flores Aguilar, 2019; García Álvarez et al., 2022; Souza Júnior et al., 2022). This growing interest in gamification by teaching teams began in the early 2010s, when Deterding et al. (2011) conceptualised the technique for the first time, defining it as the application of game design elements in non-game contexts in order to motivate players.

Sometimes, the concept of “game” has been used as a synonym for “gamification”. However, this usage is not correct as gamification is not simply “playing in class” (Romero-Rodríguez & Torres-Toukoumidis, 2018). García-Ruiz et al. (2018) in order to clarify this novel concept stresses the idea that the main objective of gamification will never be to play, but rather to the elements of the game to learn in a curricular environment in the classroom. Moreover, gamified experiences are also different from other approaches, such as Game Based Learning (GBL). This is because gamification is characterized by its long temporalization and focus on working not only academic aspects, but also social and civic competencies (García-Ruiz et al., 2018). In short, authors such as Huang et al. (2019) noted that the gamification is a process related to the stimulation of player thinking through gaming techniques to engage users and solve problems.

It is worth noting that gamification transfers the power of games to instructional and problem-solving platforms (Lee & Hammer, 2011). In this line, Sailer & Hommer (2020) point out that the gamified learning approach aims to carry out an alteration of the learning process carried out so far in order to create an experience that users interpret as a game. Thus, this pedagogical approach integrates elements and principles of game design into educational contexts with the purpose of enhancing students’ motivation, engagement, and learning (Sailer & Hommer, 2020). Among the elements typical of games that are included in a gamified experience can be found, competition and cooperation to achieve a goal;
Based on the gamification techniques destined to work with the motivation of the students, fostering a trial-and-error environment in which students feel comfortable to explore and make mistakes, the design of gamified experiences called the DMC Pyramid (dynamics, mechanics and components). The authors mentioned that the foundations of gamification are three-fold, dynamics, mechanics and components. These three elements are closely related, constituting a pyramid (Werbach & Hunter, 2012). Figure 1 shows the DMC Pyramid and the relationship of the fundamentals.

Figure 1. Pyramid of the gamification elements

<table>
<thead>
<tr>
<th>Dynamics</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotions</td>
<td>Competition, curiosity, frustration, happiness</td>
</tr>
<tr>
<td>Narrative</td>
<td>History as the common thread of the game.</td>
</tr>
<tr>
<td>Progression</td>
<td>Evolution and development of the player.</td>
</tr>
<tr>
<td>Relationships</td>
<td>Social interactions that occur during the experience.</td>
</tr>
</tbody>
</table>

In an intermediate level, the mechanics can be distinguished whose main mission is to help the participant to achieve the dynamics proposed (Werbach & Hunter, 2012). These elements describe the objectives, rules, types of interaction and limits of the situation to be played (Díaz-Delgado, 2018). Among the mechanics, it could be found the collaboration, competition, levels, rewards, transactions, feedback or challenges (Werbach & Hunter, 2012). For clarification of these concepts, considering Werbach & Hunter (2012), Table 2 is given below.

<table>
<thead>
<tr>
<th>Mechanics</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collaboration</td>
<td>Teamwork to achieve a goal.</td>
</tr>
<tr>
<td>Competition</td>
<td>There are losers and winners.</td>
</tr>
<tr>
<td>Levels</td>
<td>To inform the participants about their progress.</td>
</tr>
<tr>
<td>Rewards</td>
<td>Benefits acquired after achieving an objective.</td>
</tr>
<tr>
<td>Transactions</td>
<td>Trade between players.</td>
</tr>
<tr>
<td>Feedback</td>
<td>Reaction or response to the process or activity.</td>
</tr>
<tr>
<td>Challenges</td>
<td>Activities that require an extra effort from the players.</td>
</tr>
</tbody>
</table>

Lastly, at the lowest level are the components that are recognised as the specific implementations of both dynamics and mechanics (Ortiz-Colón et al., 2018). These...
elements could be avatars, points, badges, leader boards, graphs, among others. These components are defined considering Werbach & Hunter (2012) in Table 3.

### Previous reviews

Different reviews of the scientific literature (Alomari et al., 2019; Ishaq et al., 2021; Navarro Mateos et al., 2021; Sera & Wheeler, 2017; Silva et al., 2020; Souza Machado et al., 2018) have focused their efforts on analysing the application of gamification elements in educational practices at different educational stages. In this way, for instance, Sera & Wheeler (2017) conducted a non-systematic review on the use of digital games in pharmacy students and other health professionals, i.e., undergraduate students. Likewise, Souza et al. (2018) systematic mapping study to identify methods related to games, this time, in the context of software engineering education. Again, this review addresses a higher education population. Silva et al. (2020) on the other hand map the literature that addresses the application of gamification techniques in management education at different educational stages, not only at the university stage.

Alomari et al. (2019) performs a systematic review with PRISMA of literature focused on promoting student learning through gamification techniques. This research uses different databases during the procedure for obtaining the sample (Google scholar, Springer, ERIC, IEEE Xplore and Science Direct), however omitted the Web of Science (WoS) database. In addition, Alomari et al. (2019) despite being from 2019, it only incorporates studies from 2016 to 2018. Ishaq et al. (2021) also addresses this issue with a systematic review, but without using the PRISMA model. These authors (Ishaq et al., 2021) present a review of published research on mobile-assisted language learning and gamification for all educational stages. Finally, Navarro Mateos et al. (2021) presented a systematic review on the use of gamification in Spanish education, covering the application of this methodological strategy at university, secondary school, high school and primary school levels. The results of the study showed that only 6.7 % of the studies applied gamification in the latter stage. In this regard, none of the mentioned reviews systematically address gamification-based content for early childhood and primary education, covering all subject areas integrated into the curricula.

### Aim and research questions

Based on this background, the main aim of this study is to implement a thematic analysis on the use of gamification in early childhood and primary students. For this purpose, the following research questions has been created:

- **RQ1.** Which are the main objectives of research that implements gamification at these stages?
- **RQ2.** What are the characteristics of the research sample implementing gamification at these stages?
- **RQ3.** Which areas of the curriculum is gamification used for?
- **RQ4.** What technological resources support the development of these gamified experiences?
- **RQ5.** What type of dynamics are used in studies?
- **RQ6.** What type of mechanics are used in studies?
- **RQ7.** What type of components are used in studies?
- **RQ8.** Which are the main findings of this research?

### Method

In order to respond to the main objective of the research, a systematic literature review (SLR) (García-González & Ramírez-Montoya, 2019) was conducted to identify, select and collect the relevant research related to the application of experience gamification in early childhood and primary education classrooms.

To this end, the methodology used to conduct a SRL in the in the current investigation is called PRISMA model (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), which was proposed by Page & Moher (2017). This model is characterised by the fact that the review process is divided into seven stages (Lorenzo et al., 2021). In this sense, in the first stage, the research questions were established. To continue, the initial database search is conducted. Thirdly, the inclusion and exclusion criteria for the studies are established. Then, the studies are selected according to the previously established criteria until the final sample is obtained. At this point, the data are analysed and extracted. Once the data have been analysed, a summary and interpretation of the findings is made. And, to conclude, the review report is written.

### Article search strategy

The Web of Science was selected as the main instrument to conduct the search of the current scientific literature with reference to the objective of the research. This database was selected because it is one of the most complete, since it has more than 22,000 indexed journals and there are many articles that can only be accessed through it (Lorenzo et al., 2021). To perform the initial database searching, it is convenient to select the appropriate terms to obtain the greatest number of articles focused on the topic, since, as Cronin et al. (2008) indicated, considering synonymous terms is vital to increase the information of systematic literature review. In this line, Table 4 includes the main terms and their synonyms that were used in the composition of the search command applied in the WoS.
Consequently, the following advance search command was applied, which is configured taking as a reference the terms close to the research objective. The search command is configure using parentheses and Booleans. This command is presented in Table 5.

<table>
<thead>
<tr>
<th>Table 5. Inclusion and exclusion criteria</th>
<th>Pre-primary/Pre-school or Early childhood education</th>
<th>Elementary education/Primary education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inclusion criteria</td>
<td>Exclusion criteria</td>
<td></td>
</tr>
<tr>
<td>INC 1. Type of research: Education</td>
<td>EXC 1. Repeated documents</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>INC 2. Research areas: Education</td>
<td>EXC 2. Documents without access.</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>Educational Research and Computer Science</td>
<td>EXC 3. Type of documents: articles</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>INC 4. Language: English</td>
<td>EXC 4. Research conducted in a clinical context</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>INC 5. Type of studies: experimental or quasi-experimental</td>
<td>EXC 5. Participants not attending pre-school or primary school</td>
<td>---------------------------------------</td>
</tr>
</tbody>
</table>

After applying the command, a total of 399 documents were obtained and the inclusion and exclusion criteria began to be applied until the final sample was obtained.

**Inclusion and exclusion criteria**

The different inclusion and exclusion criteria are formulated in accordance with the research objective were applied throughout the process aimed at obtaining the final sample of documents (Lorenzo et al., 2021). Table 6 below shows the inclusion and exclusion criteria used in this process.

<table>
<thead>
<tr>
<th>Table 6. Inclusion and exclusion criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inclusion criteria</td>
</tr>
<tr>
<td>INC 1. Type of research: Education</td>
</tr>
<tr>
<td>INC 2. Research areas: Education</td>
</tr>
<tr>
<td>Educational Research and Computer Science</td>
</tr>
<tr>
<td>INC 4. Language: English</td>
</tr>
<tr>
<td>INC 5. Type of studies: experimental or quasi-experimental</td>
</tr>
</tbody>
</table>

The period chosen for the inclusion of papers begins in 2011, because it was the year that gamification was first conceptualized by Deterding et al. (2011). Papers published up to 2021 were included, because the search was initiated in 2022. Likewise, areas linked to the educational focus of the study and according to the technological component of gamification were chosen. Articles were included to ensure the presence of the highest scientific quality papers. The language chosen was English, which is the most widely used for scientific dissemination (Lorenzo et al., 2016). In addition, works that implied an intervention in the educational reality were included, so non-experimental research and clinical contexts were excluded. Finally, duplications were taken into account to exclude repeated papers.

**Review process**

As mentioned above, the initial WoS search resulted in a total of 399 papers (identification stage). From this point onwards, inclusion and exclusion criteria began to be applied throughout the different stages of the process following the PRISMA model (Page & Moher, 2017). Then, in a second stage called screening, inclusion criteria 1, 2, 3 and 4 were applied in addition to exclusion criteria 1 and 2, resulting in a total number of 100 papers. In this regard, figure 2 shows the number of papers removed depending on the exclusion and inclusion criteria employed. In the third phase, eligibility, the inclusion criteria number 5 and the exclusion criteria number 3, 4, 5 and 6 were applied. Finally, in the phase 4 which specifies the final sample, 24 papers were included. The search process was conducted between February and March 2022. The Figure 2 presents the process conducted to obtain the final sample.

**Data analysis**

To conduct the data analysis of the 24 articles a series of indicators are proposed, such as: objective, participants, area of work, resources, game elements (dynamics, mechanics and components) and findings. In this sense, in the Table 7, a description of the indicators, related to the research questions, which constitute the parameters on which the analysis of the documents included in the final sample is focused, is presented.
Table 7. Indicators and Description

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
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<tbody>
<tr>
<td>11. Aim</td>
<td>Refers to the main objective of the article that the authors intend to achieve.</td>
</tr>
<tr>
<td>12. Sample</td>
<td>Refers to the number of study participants and their age.</td>
</tr>
<tr>
<td>13. Area</td>
<td>Refers to the area of the curriculum on which the gamified experience is focused.</td>
</tr>
<tr>
<td>14. Resources</td>
<td>ICT resources applied to help develop the gamified experience.</td>
</tr>
<tr>
<td>15. Dynamics</td>
<td>Represent the gamification system in relation to the expectations: emotions, narrative, progression, relationships.</td>
</tr>
<tr>
<td>16. Mechanics</td>
<td>Describe the objectives, rules, types of interaction and limits of the situation to be played: collaboration, competition, levels, rewards, transactions, feedback, challenges, randomness.</td>
</tr>
<tr>
<td>17. Components</td>
<td>Refers to the concrete way to realize what the game mechanics require: avatar, points, badges, leader boards, graphs…</td>
</tr>
<tr>
<td>18. Findings</td>
<td>Refer to the main findings of the research in terms of its specific objectives or research questions.</td>
</tr>
</tbody>
</table>

Results

Following the data analysis, the results obtained according to the research questions are shown below. Specifically, Table 8 shows the 24 articles in the sample according to the indicators.

Table 8. Articles included in the systematic review

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>To develop and implement game elements with well-designed m-learning activities to enhance motivation.</td>
<td>Natural Science and Life Technology</td>
<td>Computer application</td>
<td>Mathematics</td>
<td>Language, natural science, history, and geography</td>
<td>Algorithmic thinking skills</td>
<td>Emotional and social competences</td>
<td>Science</td>
<td></td>
</tr>
<tr>
<td>Study Authors &amp; Year</td>
<td>Study Design</td>
<td>Sample Size</td>
<td>Variables</td>
<td>Gender/Family</td>
<td>Tools/Methods</td>
<td>Findings/Conclusions</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>García et al. (2019)</td>
<td>To evaluate a gamified e-learning platform to train children in traffic safety</td>
<td>N = 273</td>
<td>Traffic education, Moodle</td>
<td></td>
<td></td>
<td>The results indicate that the intervention through 10 conceptually coherent texts had a slightly positive, but statistically insignificant effect in reference to the use of 10 leveled texts. This slightly higher score is observed in Scientific Vocabulary Knowledge and Reading Comprehension. There is also no difference in the reading comprehension test. On the other hand, there are no differences in reading comprehension between the gamification plus test condition and the gamification only condition. In the MAP test subscores, significant differences (p=0.02) were obtained in the art and structure of the informative texts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ioannou et al. (2019)</td>
<td>To present a playful design model for learning through interactive boards,</td>
<td>N = 28</td>
<td>Socio-emotional education from the national curriculum</td>
<td>Interactive tabletops</td>
<td></td>
<td>The results show significant differences between boys and girls in the success variable in the mathematical-logical intelligence game (p=0.000); body and visual intelligence (p=0.011), and in the differences in the accuracy variable of the emotional (p=0.039). No significant gender differences were found for the remaining variables and games. According to the school year, there were significant differences in accuracy, time and precision in each game.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riaz et al. (2019)</td>
<td>To analyse the effects of a gamified exergaming intervention compared to non-gamified and non-exergaming interventions on psychological variables relevant to physical education.</td>
<td>N = 447</td>
<td>Physical education</td>
<td></td>
<td></td>
<td>The results indicate that the control group was shown to have less intrinsic motivation over time. Moreover, external regulation decreased significantly in the experimental group over time and increased in the control group, but not significantly. However, there is no difference in the decrease of amotivation over time. Temporal transformation in the control group decreased significantly over time but did not increase significantly in the experimental group. Besides, there are no differences in BPN. On the other hand, there are significant differences in rhythmic motor skills in favour of the gamified activities. Finally, there are significant differences in engagement and behaviour towards learning in students.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quintas et al. (2020)</td>
<td>To test the effect of flipped classroom and gamification on the development of motivation, autonomy and self-regulation</td>
<td>N = 202</td>
<td>Healthy Habits and Diet</td>
<td>LMS Moodle platform</td>
<td></td>
<td>The application of these methods promoted an increase in students’ motivation, as well as in their autonomy and self-regulation when facing the contents of the subject. Moreover, no strong correlations were observed between the constructs of motivation,</td>
<td></td>
<td></td>
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</tbody>
</table>

The study suggests that a model of gamified design for learning can be realized in the interaction of tabletop technology, pedagogy, and gamification. Moreover, the implementation of the model in the socio-emotional education classroom can enable students to playfully engage in understanding the "other" by fostering collaboration, empathy, and physical social interactions.
According to the aim of research

Figure 3 below presents the results related to the objectives established in each of the sample investigations.

In the first place, it is possible to distinguish a 45.83% of research (Hallowula et al., 2018; Hsu & Wang, 2018; Isayama et al., 2016; Kim et al., 2019; Lamrani & Abdelwahed, 2020; Puig et al., 2021; Quintas et al., 2020; Quintas & Bustamante, 2021; Rawendy et al., 2017; Wardani et al., 2021). The results indicate, in the first place, that the study is partially applicable. On the one hand, it has a realistic didactic design and its adaptability to different contexts, but the materials and facilities, as well as the low expectations of students about its use in the future. It is also useful because it produces more fun, motivation, greater enjoyment of dance, less embarrassment about dancing, more creative inspiration, more autonomous learning, and provides a digital leisure alternative. Finally, gamification provided a greater overall positive feeling and more motivation in the majority of students than the exergame.
al., 2019; Zhao et al., 2021) that develops and implements gamified activities with the help of various electronic applications to improve the academic achievement of students in the contents of an area of knowledge. In this sense, some research such as those developed by Quintas et al. (2020) and Quintas & Bustamante (2021) focus their objective on analysing the effects of gamified exergaming intervention on psychological variables relevant to physical education which are related with the academic achievement. Similarly, other research applies gamification and measures its effect on academic performance in aspects related to Chinese language (Rawendy et al., 2017), cube nets (Wardani et al., 2019), algorithmic thinking skills (Hsu & Wang, 2018) or geometry (Puig et al., 2021).

Secondly, the general objective of 12.50 % of the research (Gómez-García et al., 2020; Hursen & Bas, 2019; Su & Cheng, 2015) is related to the improvement of students’ motivation through the implementation of gamified experiences. In this sense, Su & Cheng (2015) aims to develop and implement gamification elements with well-designed m-learning activities to improve motivation, while Hursen, & Cizem (2019) seeks to determine the impact of gamification applications on learning motivation and the opinions of students and families. Gomez-Garcia et al. (2020), on the other hand, attempts to test the effect not only of gamification, but also of flipped classroom on motivation development.

Furthermore, a 20.83 % (Almeida et al., 2021; Garcia-Sanjuan et al., 2018; Garmen et al., 2019; Ioannou et al., 2019; Sudarmilah et al., 2020) aim to describe the designed software design and test its effectiveness. For example, in the case of Sudarmilah et al. (2020) the software model is called (Software Development Life Cycle). Another 8.33 % (Cruz-Garcia et al., 2021; Ros MORENTE ET AL, 2018) focus on exploring and developing aspects related to emotional competence. And an additional 12.50 % (Quintas-Hijos et al., 2020; Riaz et al., 2019; Ríos Feliz et al., 2020) focuses on investigating the applicability of gamification in early childhood and primary education classes and the acceptance of these gamified experiences by pupils.

According to the participants

Firstly, regarding the number of participants in the studies included in the sample, this ranges from 3 participants in the case of the research conducted by Su & Cheng (2015) to 574 participants in the research by Ros-Morente et al. (2018). Figure 4 shows the results of the sample size.

On the one hand, among the studies with less than a hundred participants are those developed by Rawendy et al. (2017) (n=30); Isayama et al. (2016) (n=90); Halloluwa et al. (2018) (n = 70); Garcia-Sanjuan et al. (2018) (n=80); Hursen, & Cizem (2019) (n=16); Wardani et al. (2019) (n=86); Ioannou (2019) (n=28); Riaz et al. (2019) (n=44); Lamrani & Abdelwahed (2020) (n=30); Sudarmilah et al. (2020) (n=64); Puig et al. (2021) (n=60); and Almeida et al. (2021) (n=50). This group of papers constitutes 45.83 % of the sample. On the other hand, studies with 100 or more than a hundred participants (54.17 %) correspond to Hsu & Wang (2018) (n=242); Ros-Morente et al. (2018) (n=574); Garmen et al. (2019) (n=372); Kim et al. (2019) (n = 273); Quintas et al. (2020) (n=417); Gómez-Garcia et al. (2020) (n=202); Ríos et al. (2020) (n=102); Quintas-Hijos et al. (2020) (n=417); Cruz-García et al. (2021) (n=100); Zhao et al. (2021) (n=130); and Quintas & Bustamante (2021) (n=417).

Secondly, considering the age range of the participants in the studies, the results indicate that they range from 4 to 12 years old. In this regard, 8.33 % of the studies (Garmen et al., 2019; Lamrani & Abdelwahed, 2020) involve 4-year-olds. In 12.50 % of studies (Garmen et al., 2019; Kim et al., 2019; Lamrani & Abdelwahed, 2020), 5-year-olds participate. As for 6-year-olds, they participate in 29.17 % of the studies (Garmen et al., 2019; Ioannou, 2019; Kim et al., 2019; Lamrani & Abdelwahed, 2020; Rawendy et al., 2017; Sudarmilah et al., 2020; Zhao et al., 2021). In 20.83 % (Garmen et al., 2019; Ioannou, 2019; Rawendy et al., 2017; Sudarmilah et al., 2020; Zhao et al., 2021) and 25.00 % (Garmen et al., 2019; Halloluwa et al., 2018; Ioannou, 2019; Rawendy et al., 2017; Sudarmilah et al., 2020; Zhao et al., 2021) of the studies involved pupils aged 7 and 8 years, respectively. Those participants aged 9 years participated in 45.83 % of the sample (Garcia-Sanjuan et al., 2018; Garmen et al., 2019; Hsu & Wang, 2018; Ríos et al., 2017; Ríos Felix et al., 2020; Sudarmilah et al., 2020; Zhao et al., 2021).

In the case of pupils aged ten years, 79.17 % of the sample have their participation (Almeida et al., 2021; Cruz-Garcia, 2021; Garcia-Sanjuan et al., 2018; Hsu & Wang, 2018; Hursen & Bas, 2019; Ioannou et al., 2016; Ioannou, 2019; Quintas et al., 2019; Quintas & Bustamante, 2021; Quintas et al., 2020; Riaz et al., 2019; Ríos Felix et al., 2020; Sudarmilah et al., 2020; Zhao et al., 2021).
Quintas-Hijós et al., 2020; Puig et al., 2021; Rawendy et al., 2017; Riaz et al., 2019; Rios Félix et al., 2020; Ros Morente et al., 2018; Su & Cheng, 2015; Sudarmilah et al., 2020; Wardani et al., 2019; Zhao et al., 2021). Furthermore, eleven-year-old students are included in 70.83% of the studies (Almeida et al., 2021; Cruz-García et al., 2021; García-Sanjuan et al., 2018; Gómez-García et al., 2020; Halloluwa et al., 2018; Hsu & Wang, 2018; Hursen, & Cizem, 2019; Isayama et al., 2016; Ioannou, 2019; Quintas et al., 2020; Quintas & Bustamante, 2021; Quintas-Hijós et al., 2020; Lamrani & Abdelwahed, 2020; Rawendy et al., 2017; Riaz et al., 2019; Rios Félix et al., 2020; Ros Morente et al., 2018; Su & Cheng, 2015; Wardani et al., 2019; Zhao et al., 2021).

Finally, students aged twelve years participate in 62.50% of the sample (Almeida et al., 2021; Cruz-García et al., 2021; García-Sanjuan et al., 2018; Garren et al., 2019; Gómez-García et al., 2020; Halloluwa et al., 2018; Hsu & Wang, 2018; Hursen, & Cizem, 2019; Isayama et al., 2016; Ioannou, 2019; Kim et al., 2019; Lamrani & Abdelwahed, 2020; Puig et al., 2021; Riaz et al., 2019; Quintas & Bustamante, 2021; Rawendy et al., 2017; Rios Félix et al., 2020; Ros Morente et al., 2018; Sudarmilah et al., 2020; Wardani et al., 2019; Zhao et al., 2021).

**According to the area of curriculum worked on**

Figure 5 shows the results related to the areas worked with gamification.

![Figure 5: Results according to area of curriculum worked.](image-url)

The results of the analysis show, firstly, 8.33% of the studies (Hursen & Bas, 2019; Rios Félix, 2020; Ros Morente et al., 2018) focus on the area of socio-emotional education. In this sense, on the one hand, Ros-Morente et al. (2018) focus on emotional competence in everyday life situations and in conflict situations that may arise at school. And, on the other hand, Ioannou (2019) focuses on working on emotional competence. In particular, on the skills of perspective-taking and understanding the other. A 12.50% of the studies (Quintas et al., 2020; Quintas-Hijós et al., 2020; Quintas & Bustamante, 2021) focus their gamified activities on the area of physical education, specifically dance. In addition, 16.67% of the sample is constitute by studies working in the area of language (García-Sanjuan et al., 2018; Kim et al., 2019; Lamrani & Abdelwahed, 2020; Rawendy et al., 2017). The analysis shows that García-Sanjuan et al. (2018) and Lamrani & Abdelwahed (2020) also work with content of the area of science. Nevertheless, the other studies mainly target language skills related to Chinese language learning, namely vocabulary (2017) or in the case of Kim et al. (2019) to learning not only English language vocabulary but also reading comprehension skills.

The sample is also composed of 54.17% of articles focusing on the area of science. Specifically, Su & Cheng (2015) explore the curriculum area called "Science of Nature and Technological Life" by conducting gamified activities on botany. Authors such as Isayama et al. (2016), Rios et al. (2020), Hsu & Wang (2018); Cruz-García et al. (2021) and Almeida et al. (2021) focus their efforts on working on aspects related to the area of computer science, either by creating video games or learning programming language commands. Other authors (Halloluwa et al., 2018; Puig et al., 2021; Wardani et al., 2019; Zhao et al., 2021) use gamification to work on mathematics content such as the geometric figure of the cube (Wardani et al., 2019), geometry in general (Puig et al., 2021) or varied content (Garcia-Sanjuan et al., 2018; Halloluwa et al., 2018; Riaz et al., 2019; Cruz-García et al., 2021).

Other studies cover curriculum areas such as traffic education (Riaz et al., 2019), multiple intelligences (Garmen et al., 2019); healthy habits and diet (Gómez-García et al., 2020) or knowledge about Indonesian culture (Sudarmilah et al., 2020).

**According to ICT resources employed in the gamification experience**

Different digital resources have been used in the gamified experiences. In this sense, there is research such as those developed by Rawendy et al. (2017), Halloluwa et al. (2018), Lamrani & Abdelwahed (2020) or Puig et al. (2021) that use computer, tablet or unnamed mobile applications to develop the activities. These applications are designed by the authors themselves, as in the case of Rawendy et al. (2017) for learning Chinese vocabulary or Halloluwa et al. (2018) for learning mathematical content. However, other studies (Cruz-García et al., 2021; García-Sanjuan et al., 2018; Kim et al., 2019; Quintas et al., 2020; Quintas-Hijós et al., 2020; Quintas & Bustamante, 2021; Ros Morente et al., 2018; Su & Cheng, 2015; Wardani et al., 2019) use apps with names such as MGLS application, Quizbot app, Happy 8-12 app, Jariku app, MORE@Home app, Blocky or Just Dance Now. In other gamified experiences (Hursen & Bas, 2019; Quintas et al., 2020; Quintas-Hijós et al., 2020; Quintas & Bustamante, 2021; Riaz et al., 2019) they use platforms for behaviour management and student progress such as Class Dojo or Moodle. Other authors also use resources such as interactive books (Zhao et al., 2021), augmented reality (Sudarmilah et al., 2020) or what are known as serious games (Almeida et al., 2021).

**According to the dynamics employed in the gamification experience**

In terms of the dynamics used in the gamification experience, 87.50% of the sample used some type of these strategies. Figure 6 shows the results.
Based on gamification (2021). Nonetheless, in the research dents, such as joy, pleasure and interest through activities that they aim to develop different emotions in stu-
was relationships. The development of these dynamics is observed in, for example, the research developed by García-Sanjuan et al. (2018; Su & Cheng, 2015) which constitute the 70.83 %,
use the dynamics of progression, since they look for the evolution and development of the player throughout a process that has a beginning and an end. Secondly, 12.50 % of the studies (Halloluwa et al., 2018; Hursen & Bas, 2019; Zhao et al., 2021) employ another type of dynamic called narrative. For instance, Zhao et al. (2021) implements gamification with a story based on elves, where the students are the warriors in charge of uncovering the mystery that the elves hide.

Thirdly, another dynamic employed in 12.50 % of the studies (García-Sanjuan et al., 2018; Su & Cheng, 2015) was relationships. The development of these dynamics is observed in, for example, the research developed by García-Sanjuan et al. (2018) focused on establishing collaborative relationships between students during the gamified experience. And, Fourthly, the last dynamic used is made up of emotions. In this sense, authors such as Puig et al. (2021) and Quintas & Bustamante (2021) explicitly state in their research that they aim to develop different emotions in students, such as joy, pleasure and interest through activities based on gamification (2021). Nonetheless, in the research conducted by Gómez-García et al. (2020), Lamrani & Abdelwahed (2020) and Sudarmilah et al. (2020) no dynamics of any kind were specified.

**According to the mechanics employed in the gamification experience**

Different types of mechanics are used in the different investigations that compose the sample. Figure 7 shows the results.

The most mechanic employed among the sample are levels (Almeida et al., 2021; Cruz-García et al., 2021; Gómez-García et al., 2020; Hsu & Wang, 2018; Kim et al., 2019; Lamrani & Abdelwahed, 2020; Puig et al., 2021; Quintas et al., 2020; Ríos Félix et al., 2020; Ros Morente et al., 2018). This sense, more than half (54.17 %) of the investigations use this mechanics. In the research of Hsu & Wang (2018), the courses are classified into two levels, but they are not sequential, students can solve the puzzles as they see fit. In addition, the participants (wizards) are classified into fourteen levels, from level 0 which corresponds to the novice wizard they can level up as they gain magic points. Another example of levels is shown in the gamified experience carried out by Quintas et al. (2020) who establish ten levels of difficulty. To advance to the next level, they must pass the previous level. In this research, each level corresponds to a song, with level 1 being "Rasputin" and level 10 "Jambo Mambo".

In 25.50 % of the studies (García-Sanjuan et al., 2018; Halloluwa et al., 2018; Hursen, & Cizem, 2019; Ioannou, 2019; Quintas et al., 2020; Quintas-Hijos et al., 2020; Su & Cheng, 2015), collaboration is observed as the mechanics used. In this sense, Su & Cheng (2015) provide collaborative activities for learning. In this way, teamwork is essential to solve the tasks. Moreover, Halloluwa et al. (2018) develops an intervention where collaboration among team members is necessary to meet the objectives of the activity. Along the same lines, for example, Garcia-Sanjuan et al. (2018) indicate that the Quizbot application establishes a common goal for which it is only possible to achieve it by working as a team, making use of coordination, communication and positive interdependence between the members of the group.

According to Hursen, & Cizem (2019), the development of the activities of the gamified experience are based on cooperative learning. In this way, points are assigned not only individually, but also in teams. In the case of Ioannou (2019) all three phases of the intervention use the mechanics of collaboration, namely guessing the story told in the puzzle among all team members (phase 1), explaining together how the hero of the story might feel (phase 2) or selecting the best ending for the story (phase 3). Research by Quintas et al. (2020) and Quintas-Hijos et al. (2020) propose the same gamification scenario where students are asked to collaborate to create a group choreography as the main activity.

In addition, in 20.83 % of the studies (Hursen, & Cizem, 2019; Ioannou, 2019; Quintas et al. 2020; Quintas-Hijos et al., 2020; Quintas & Bustamante, 2021) the mechanics of the competition are distinguished. To do this, the authors Hursen, & Cizem (2019) propose a mechanics in which the groups of students who engage in the activities...
compete, as a final comparison is established on the basis of the points obtained throughout the experience. Along the same lines, Ioannou (2019) in phase 3 of his intervention each group presents an alternative final and competes with the rest of the teams, as there will only be one winner. In the research by Quintas et al. (2020), Quintas-Hijos et al. (2020) and Quintas & Bustamante (2021) the teams compete to see who receives the highest score.

There are also 16.67 % of studies (Halloluwa et al., 2018; Hursen & Cizem, 2019; Ioannou, 2019; Riaz et al., 2019) where participants receive feedback after responding to a task or performing an activity. For example, in the case of Halloluwa et al. (2018) this feedback is received at the end of each level of the activity. In this way, when the attempt is successful, a congratulation window appears and if the attempt is unsuccessful, the student receives an encouraging response to try again. Hursen & Cizem (2019) use the ClassDojo platform to provide feedback on the progress of individual learners in the sessions which is always available to learners. In Ioannou' research (2019), the correct answer is coloured green, and the incorrect answer is coloured red, providing correction and feedback to students. And Riaz et al. (2019), when the answer was given, the students received a video and audio feedback about the correct answer.

Furthermore, there is a percentage (33.33 %) of research (Halloluwa et al., 2018; Hursen & Bas, 2019; Ioannou, 2019; Lamrani & Abdelwahed, 2020; Quintas et al., 2020; Quintas-Hijos et al., 2020; Riaz et al., 2019; Su & Cheng, 2015) that provide participants with benefits after reaching a goal, in other words, rewards. Authors such as Halloluwa et al. (2018) developed a reward system with the use of stars, ensuring that all learners received at least some reward for attempting the activities. In the case of Ioannou (2019) the rewards implemented are social. Moreover, other reward use is a cartoon character as in the research of Lamrani & Abdelwahed (2020) On the other hand, in a 66.67 % of research (Almeida et al., 2021; Garcia-Sanjuan et al., 2018; Garmen et al., 2019; Gómez-García et al., 2020; Cruz-García et al., 2021; Hsu & Wang, 2018; Isayama et al., 2016; Kim et al., 2019; Puig et al., 2021; Quintas & Bustamante, 2021; Rawendy et al., 2017; Rios Félix et al., 2020; Ros Morente et al., 2018; Sudarmilah et al., 2020; Wardani et al., 2019; Zhao et al., 2021) it is unclear which type of rewards are used.

Additionally, 37.50 % of the sample (Cruz-García et al., 2021; Garmen et al., 2019; Gómez-García et al., 2020; Ioannou, 2019; Puig et al., 2021; Quintas et al., 2020; Quintas-Hijós et al., 2020; Wardani et al., 2019; Zhao et al., 2021) incorporates challenge activities during the development of the learning experience. There are some research studies such as Wardani et al. (2019), Quintas et al. (2020), Quintas-Hijós et al. (2020) or Puig et al. (2021) where the authors refer to the use of challenges, without specifying exactly what they consist of. Authors such as Cruz-García et al. (2021) also do not describe the challenges presented, however specify the fact that these challenges increase in difficulty as the students’ progress.

Authors as Ioannou (2019) indicate that different types of challenges are presented in the three phases of the project. For example, in the first phase, the challenge consists of guessing the story being told while assembling a puzzle. In the second phase, the challenge consists of explaining how the hero of the story might feel. And, in the third phase, the challenge involves recording the possible good or bad endings of the story, considering “what would happen to the hero if…”.

In the case of Garmen et al. (2019), it is noted that the types of challenges proposed throughout the gamified experience are of different types: logical, visual, natural, linguistic, corporeal, emotional and musical. In this regard, researchers such as Gómez-García et al. (2020) establish a close relationship between the challenges and the exercises and activities of the didactic unit. These authors also give some examples of these challenges, such as bringing a piece of fruit twice a week to eat during the rest period, the preparation of a weekly record in which the amount of physical exercise performed per day was determined, or a research project on the unknown properties of some vegetables. Along the same lines, Zhao et al. (2021) the quizzes that students must complete during the process correspond to challenges.

According to the components employed in the gamification experience

The results regarding the components used in gamification are presented in Figure 8.

Figure 8. Results according to components employed in the gamification experience.

Among the gamification components implemented in the experiences addressed in the articles in the sample, we can distinguish, first of all, the leader boards. Among the gamification components implemented in the experiences addressed in the articles in the sample, we can distinguish, first of all, the points boards in a 33.33 % (Halloluwa et al., 2018; Hsu & Wang et al., 2018; Hursen & Bas, 2019; Puig et al., 2021; Quintas et al., 2020; Quintas-Hijos et al., 2020; Quintas & Bustamante, 2021; Su & Cheng, 2015). Specifically, authors such as Su & Cheng (2015) or Hursen, & Cizem (2019) name the aforementioned boards, but do not give a detailed description of them. In the case of Halloluwa et al. (2018) a league table that uses stars to recognize the achievements of the participants. Puig et al. (2021) a league table highlighting the social status achieved by the player. Hsu & Wang’s (2018) league table reflects much more information, as it shows a ranking of participants.
based on magic points, experience points, skill points, wizard levels and stars. In the same direction, in the research developed by Quintas et al. [43], Quintas-Hijós et al. (2020) and Quintas & Bustamante (2021) the leaderboard was designed virtually using Microsoft Excel where the average scores of the students for each dance and the totals obtained from the beginning were indicated. Not only individually but also in groups.

Other components used in a 50.00 % of investigations (Gómez-García et al., 2020; Halloluwa et al., 2018; Hsu & Wang, 2018; Hursen & Bas, 2019; Puig et al., 2021; Quintas et al., 2020; Quintas-Hijós et al., 2020; Quintas & Bustamante, 2021; Ruiz et al., 2019; Ríos Felix et al., 2020; Su & Cheng, 2015; Zhao et al., 2021) are badges. On the one hand, despite mentioning their application, Su & Cheng (2015), Zhao et al. (2021) and Hursen, & Cizem (2019) do not describe them. On the other hand, Halloluwa et al. (2018) and Puig et al. (2021) use stars as badges and Ruiz et al. (2019) and Gómez-García et al. (2020) use bronze, silver or gold badges. Specifically, Quintas et al. [43], Quintas-Hijós et al. (2020) and Quintas & Bustamante (2021) designed a total of twelve badges for the three best dancers of each level, the three best dancers of each week, the three most improved students and the three groups with the most points overall. Finally, Ríos et al. [46] used trophies as badges.

Points are also used in others research (58.33 %) when participants complete the activities as in the case of Zhao et al. (2021) or according to the behaviours performed as in the case of Hursen, & Cizem (2019). There is also research (Hsu & Wang, 2018; Ruiz et al., 2019) that details the number of points that students can receive. In this sense, for example, in the experience reported by Hsu & Wang (2018) the participants (novice magicians) can get between 0 and 3 points depending on the result of solving the puzzle they have done. These points are transformed into "experience points" and "skill points" which, when added together, result in "magic points". Another example is the research conducted by Ruiz et al. (2019) where students could obtain a score between 0 and 100 for each module. In the case of Ioannou (2019) participants only get a score if the correct answer is selected at the first attempt. These points can be used to personalise their own avatars and obtain a higher score in the subject (Puig et al., 2021; Quintas et al., 2020; Quintas-Hijós et al., 2020; Quintas-Bustamante, 2021).

In addition, avatars are also used in investigations (37.50 %) to identify the different players, although sometimes no description of such characters is provided, as in Halloluwa et al. (2018), Cruz-García et al. (2021) or Puig et al. (2021). In contrast, other research uses avatars in the form of monsters (Quintas et al., 2020; Quintas-Hijós et al., 2020; Quintas & Bustamante, 2021) or warriors (Zhao et al., 2021). Finally, performance graphs are also used in research such as Halloluwa et al. (2018) and Ruiz et al., (2019).

**According to the findings of the studies**

The results of the studies included in the sample are presented below. First of all, the analysis of the results indicates that 62.50 % of the whole sample (Cruz-García et al., 2021; Garman et al., 2019; Hsu & Wang, 2018; Kim et al., 2019; Lamrani & Abdelwahed, 2020; Puig et al., 2021; Quintas et al., 2020; Rawendy et al., 2017; Riaz et al., 2019; Ros Morente et al., 2018; Su & Cheng, 2015; Sudarmilah et al., 2020; Zhao et al., 2021) which conclude that the use of gamification has led to improved participant achievement. For example, Rawendy et al. (2017) indicate significant differences between the pre-test and post-test with a (2-tailed) value of 0.000 (p<0.05), indicating that the application of gamification improves learners’ knowledge of Chinese language vocabulary. Hsu & Wang (2018) also show significant differences (p = 0.000) between the groups using gamification techniques for the development of puzzle-building activities and those using a traditional approach. In the research conducted by Ros Morente et al. (2018) these significant differences correspond to a p = 0.02. Other research such as that developed by Cruz-García et al. (2021) observe significant differences (p=0.000) in programming knowledge between the October 2019, December 2019 and February 2020 tests, concluding that there is an increase in this knowledge.

Secondly, there is another group of studies that constitutes 29.17 % of the sample (Cruz-García et al., 2021; Gómez-García et al., 2020; Hursen & Bas, 2019; Quintas et al., 2020; Quintas-Hijós et al., 2020; Su & Cheng, 2015; Zhao et al., 2021) determined that gamification improves student motivation. Among these studies, Su & Cheng (2015) observed significant differences in the motivational dimension between the control group and the control group with a p-value of less than 0.05 (t = 2.538, sig. = 0.022). In the same line, Hursen, & Cizem (2019) find significant differences between pre-test and post-test in all dimensions related to motivation, except in the one focused on "motivation to participate" (p=0.206). Thus, significant differences are observed in "motivation to investigate" (p=0.025), "motivation to perform" (p=0.040), "motivation to communicate" (p=0.038) and "motivation for cooperative study" (p=0.043). On the contrary, authors such as Quintas & Bustamante (2021), one-way ANOVA analyses (post-pre) showed, on the one hand, that the control group showed less achievement motivation as time went by and, on the other hand, that the experimental group did not show more or less achievement motivation over time. In this sense, all these studies conclude that gamification can be an effective educational tool for promoting student motivation.

Thirdly, 20.83 % of the studies (Almeida et al., 2021; Cruz-García et al., 2021; Quintas-Hijós et al., 2020; Quintas & Bustamante, 2021; Wardani et al., 2019) whose results show that the application of gamification creates experiences of enjoyment and generates satisfaction in students can be differentiated. This satisfaction on the part of the students is observed throughout the sessions carried out by Cruz-García et al. (2021) and is reflected by the teachers in the interviews conducted. Similarly, Almeida et al. (2021) also reports student satisfaction. Specifically, this research
shows that 92.00% of students were satisfied with the experience. Likewise, Quintas & Bustamante (2021) showed that the use of gamified games produced significant differences in student satisfaction. In addition, Quintas & Bustamante (2021) showed that students enjoyed the use of gamified games more than those where this type of technique was not applied (p = 0.02).

To be continued, it is observed, on the one hand, 16.67% of research (Hsu & Wang, 2018; Ioannou, 2019; Puig et al., 2021; Quintas et al., 2020) where the application of gamified activities improves student engagement with the tasks. Therefore, in the Hsu & Wang (2018) research the engagement of the students who carry out the activities with gamification mechanics is significantly higher than the PBL (p = .001) and PGM groups (p = .004). On the other hand, the same percentage (16.67%) of research (Rawendy et al., 2017; Garcia-Sanjuan et al., 2018; Quintas-Hijós et al., 2020) positively evaluates the use of this technique and its ease of application. Fifthly, Gómez-García et al. (2020) and Quintas-Hijos et al. (2020) show in their results that this type of activity improves student autonomy. Also, two other studies (Halolouwa et al., 2018; Rios Félix et al., 2020) determine that their use allows for the creation of a positive learning environment.

Finally, research such as that conducted by Gómez-García et al. (2020) finds positive relationships between the use of gamification and the self-regulation of participants’ behaviour, and Garcia-Sanjuan et al. (2018) finds this relationship with the promotion of collaborative skills.

Discussion

In the following lines, the discussion of the results for each of the research questions posed at the beginning of the study is presented. In the first instance, according to the first research question focused on the objectives of the sample research, the results indicate that the highest percentage of research (37.50%) aims to improve student performance through the application of gamified experiences in the classroom. These results are in line with those presented by Manzano-León et al. (2021) where the highest percentage of articles (50.00%) included in the sample focus on improving academic achievement. This phenomenon could be explained, following Ortiz-Colón et al. (2018), by the current need of teachers and institutions to look for new innovative methodologies that allow them to adapt to the needs of students and at the same time promote significant learning, engagement and motivation towards learning. In this sense, as reported by Tsai et al. (2019) there are a number of reasons for this high level of interest in investigating the use of gamification to improve academic performance. Among them, the possibility offered by these experiences for students to be the active protagonist of their own learning, the possibility of designing gamified activities based on the curriculum and the continuous feedback received by students during the game process.

After this, responding to the second research question which is focused on the sample of participants in the studies, the results show that more than half of the studies (54.17%) have 100 or more participants. Again, our results coincide, in part, with the research carried out by Manzano-León et al. (2021), who show that, despite locating a smaller number of articles focused on the school education level (Early Childhood Education and Primary Education), 60.00% of these have a number of participants of around 100 or more. This result could be related to the positive view of gamification held by teachers at these stages, since, as Zou (2020) points out, they consider that its use promotes student motivation, confidence, communication skills and self-regulation of learning. This awareness leads to the promotion of this type of activities throughout these stages. On the other hand, the percentage of pupils between 10 and 12 years old, that is, students from 4th grade of primary education up to 6th grade, is among the highest. These results could be due to teachers thinking that pupils in this age group are more suitable for gamification than younger pupils (2016).

In the case of the third research question related to the curriculum areas worked on, our results show that more than half of the interventions, 54.17%, focus on the area of science. The reason for this result could be, as Diez et al. (2017) noted, that students feel they are the active protagonists of their learning, as the game mechanics, often organised in levels, allow them to follow their progression and get clues and opportunities for reflection when it comes to scientific problem solving. Following Kalogiannakis et al. (2021), this result, which reflects a strong focus on gamification in this area, would be supported by the fact that science education is seen as one of the essential parts of education today. This is because it is responsible for shaping a scientifically literate citizenry and fostering 21st century skills such as adaptability or problem solving.

In reference to the type of ICT resource most used throughout the research, the results of our research which reflect that the majority of cases employ gamification platforms and applications, which is in line with Zainuddin et al. (2020). These same authors (Zainuddin et al., 2020) indicate that the generalised support for the incorporation of this type of resource is based on the direct influence that gamified technologies have on learning and the potential to modernise the educational landscape in this new digital era. Thus, this use of digital gamification applications and platforms, in the words of Alhalafavy & Zaki (2019), is based on the potential of digital resources to enhance autonomy, personal development, positive relationships and environmental enabling.

According to the next research questions, the results show that the progression is the most applied dynamic along the gamification experience (70.83%). This phenomenon is also observed by authors such as Ortiz-Colón et al. (2018) who identify the presence of progression dynamics in more than half of the research (60.00%) involved in their review. This emphasis on the existence of a dynamic of progression is based on the fact that, according to Lamprinou &
half of the sample (58.33%) use points. These results are partly in line with the findings of Kalogiannakis et al. (2021) and Manzano-León et al. (2021); Lamprinou & Paraskeva (2015), who identify points among the most frequently used game elements in gamified experiences. In the case of levels, the reason why the authors use them is related to the search for a structuring of the gamification experience that allows extrinsically motivating the students (Zainuddin et al., 2020). And respect to the last category of DCM pyramid, that is components more than half of the sample (58.33%) use points. These results are positive effect on students’ motivation to learn (Manzano-León et al., 2021; Lamprinou & Paraskeva, 2015).

Finally, the results show that in reference to the last research question, the main finding of investigation is that the use of gamification techniques in 62.50% articles denote a significant increase of children achievement, this result could be explained, following Putz et al. (2020) by the change from a traditional methodology, unidirectional and passive on many occasions, to another active teaching characterized by proposing challenges appropriate to the level of the students, whose resolution leads to the acquisition of significant and functional learning for day-to-day life.

Conclusion

The systematic literature review has been found that gamification has been applied in early childhood and primary education for many areas and objectives. In this sense, from the proposed research questions, the following conclusions are indicated:

- This review identified that the main objectives of the research are aimed at improving academic performance in different areas of the curriculum, increasing motivation and improving collaboration skills.
- On the one hand, this review also identified that the number of participants in the studies ranges between 3 and 574, with the study by Ros-Morente et al. (2018) having the largest number of participants. On the other hand, students with 10, 11 and 12 years old are the ones for whom most gamified experiences have been designed and implemented.
- Gamification could be applied to teach emotional competence, physical education, language and science (mathematics, geometry, algorithmic skills, biology). The area of science corresponds to the one where most gamified experiences have been developed.
- Moreover, computer and mobile applications are the most commonly used tools to support the gamified experience.
- Despite the fact that a large number of dynamics are not usually identified, this research concludes that progression is the most commonly used dynamic in the research.
- Although a large number of dynamics are not used, again levels are the most used mechanics in research.
- In the case of components, articles reviewed apply a large number of them, highlighting the points are the most used in research.
- This review denotes that the application of gamification according to research results improves significantly academic achievement, motivation, task engagement, autonomy and enjoyment.

Despite the fact that the PRISMA methodology allows for systematised research, like any other study, the study has some limitations. Firstly, the study focuses on analysing research collected only in the WoS database, without considering others such as SCOPUS or some related to the educational field ERIC. This could have led to the omission of other articles that are not found in WoS but in other databases. On the other hand, the language selected, i.e., English, despite being the language of scientific publication par excellence, other publications of interest could have been discarded due to a lack of knowledge of the language in which they are written. Nonetheless, the strength of this research is that it provides a comprehensive review that shows that the application of gamified elements in early childhood and primary education classrooms is a reality. Moreover, it is considered necessary to increase the number of gamified elements based on the DMC Pyramid model, as this approach to the model would make it easier to adapt them to the official curriculum of the stages. In this sense, the dynamics could be associated with the didactic objectives and assessment criteria. For their part, the mechanics would correspond to the contents and methodology used, and the components to the assessment instruments.

Gamification can be a reality in the classroom and this article is a starting point for the future design of gamified experiences, as it provides an analysis for teachers to use in the future as a source of knowledge of what has been done so far and what can be improved. In this sense, future lines of study will focus on the creation of a protocol for the design of gamified experiences interrelating the DMC Pyramid model with the curricular elements.

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