The reality of the gamification methodology in Primary Education: A systematic review

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A R T I C L E   I N F O

A B S T R A C T

The vision of a playful approach to teaching and learning, mediated by game elements, has been acquiring vast relevance in recent years in educational research, crystallizing in the gamification methodology. Therefore, the goal of this study is none other than to study the integration of this methodology in the Primary Education stage, determining the existing evidence in relation to its influence on the students' learning results. In order to achieve it, a systematic review of the literature, centered around articles about gamification experiences in Primary Education ($n = 31$), published during the last five years and indexed either in Web of Science or Scopus, is conducted. The existing literature has been mainly published over the last biennium, focusing on the European context, therefore being in line with the existing gaming industry's temporary yet not geographical tendencies. Although the majority of analyzed experiences are mediated by technological resources, analogical gamification still holds a relevant position within the field. Areas linked to the STEM framework tend to be the most frequently gamified in Primary Education, in contrast to areas closely associated with Human and Social Sciences. The overall field results show positive effects on student engagement, motivation, and self-efficacy, while having retrieved negative results regarding collaboration, and mixed outcomes when it comes to learning result. Future research lines are discussed, aiming at building a framework of reference in relation to good practices in the use of gamification, as well as its proper implementation in teacher training courses.

1. Introduction

The implementation of games and game-like proposals has been of concurrent use within varied educational settings worldwide. The recent and ever-increasing relevance of videogames as entertainment media products has, as specified in Bailon et al.'s (2023) study, undoubtedly aided in increasing the utilization rate of these new playful approaches, which has risen great interest in the study of this methodology along the span of the last few lustrums (Vrcelj et al., 2023)

Being a model based on giving the learners a role and relevance akin to that of a main character within one of these digital interactive experiences, it is no wonder that younger students are the ones that tend to be most interested and proactive towards using gamification in their class sessions (Parra-González et al., 2021).

It is worth noting, however, that as Guan et al. (2024) affirm, there is barely any relevant research targeted at learners "who often

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play games on a daily basis" (p. 2), referring to the often-overlooked Primary Education. This stage, which includes learners "not below 5 years old nor above 7 years old [and] typically lasts six years" (UNESCO Institute for Statistics, 2012, p. 30), revolves around the ages during which pupils are still playfully exploring the world and actively learning from it (Piaget, 1929).

Play and entertainment hold a key role within the psychological development and lifelong learning of a human being, with special emphasis on its determinant character, underpinned by Ogneviuk et al. (2022)on children and young teenagers. Apart from enjoyment acting as a catalyst for learning itself, the active and interactive aspects of such activities bring essential personal development benefits that can be deemed crucial in the upbringing of future, competent and responsible citizens (Zheng et al., 2024).

Consequently, expanding the existing literature's conception of gamification in Primary Education as a standalone educational stage, with its particular characteristics drastically different from immediately close grades, even from the adjacent ones within the K-12 framework, becomes a necessity and a topic of deep interest for lawmakers (Tsai et al., 2020), researchers and practitioners (Moon et al., 2024) alike.

1.1. Theoretical framework. Academic consensus regarding gamification as a methodological entity

Before further dwelling into the didactic application of playful entertainment, delimiting a brief definition on such a subjective and abstract concept becomes necessary within a research field in which, to this day, multiple definitions of the very same methodological scheme still coexist.

A game can be conceptualized as, attending the definition provided by Simões and Roble (2021), a situation in which the goal is to achieve an estate or reality through the limited possibilities allowed by pre-established rules, which are commonly accepted as the reason for the existence of the game itself. Introducing interactive fun into formal, non-formal and informal educational settings has, over the years, configured a whole didactic spectrum of active methodologies either based on or inspired by this same idea.

Within this new corpus, and following the classification established by Rulyansah et al. (2023), games have taken on many varied applications within the educational field, divided in the two main categories of Game-Based Learning (GBL) and gamification. The former refers to the use of any game, although digital games are fairly common as to having established a category of their own known as Digital Game-Based Learning (Prensky, 2001). This category firstly focused on the so-called serious games, also known as educational games (Dehghanzadeh et al., 2024), designed by educators that have traditionally been criticized for being *overdidactic* to the point of offering a *pseudo-playful* user interaction (Bouroumane & Abarkan, 2023). It is worth mentioning that certain authors do not conceive GBL as a methodology of sorts, but as an actual distinct form of pupil learning derived from playing an actual game (Banihashem et al., 2024).

Despite these limited origins, the genre slowly started giving proper value to the mere notion of learning while having fun, which eventually led to the first *edutainment* products, defined by Valdés (2020) and Prindle et al. (2024) as proposals including both educational value and the possibility of actual entertaining inequal proportions. There is, nevertheless, a current research trend based on the innate educational interest of commercial games and videogames that, even if not intended for training and learning in their conception, address matters of interest to the learner in such an immersive way that meaningful involuntary learning takes place (Camuñas-García et al., 2024).

On the other hand, gamification can be defined as the implementation of game elements, usually derived either from traditional games or their digital counterparts, in non-playful educational contexts (Deterding et al., 2011; Martínez et al., 2023). Given the relative youth of this line of research, being firstly coined around 2008 (Dehghanzadeh et al., 2024) and then academically established in Deterding et al.'s (2011), certain research and teaching schools of thought consider gamification as a subcategory of GBL when, according to the previously established conceptualizations, gamification only relies on the active and purposive use of game elements without the aim of establishing general rules or limitations apart from those akin to given mechanics (Price et al., 2022), e.g. getting negative points for negative behavior. It should be equally considered that implementing extra mechanical or dynamical layers to an already existing playful scenario is merely adding extra layers to a game, not designing a gamification proposal (Gómez-García et al., 2021).

Werbach and Hunter (2020) established a three-way division among these game elements, in which each kind allows the development of elements of a higher order. From most to least complexity, the authors consider the existence of (i) dynamics, complex realities that can only appear naturally in educational proposals, (ii) mechanics, processes that vehicle the proposal and generate interest among learners, and (iii) components, specific realizations of mechanics/dynamics.

These theory-driven barriers, however, quite commonly cause confusion to a certain degree when it comes to critically classifying educational proposals that, even involving game-based activities, are still designed under a general gamification framework. Such is the case of the well-known escape rooms and breakouts, which are considered a structure involving certain key game elements aiming to *gamify* an educational setting, often punctually including games as isolated activities (Fuentes-Cabrera et al., 2020; Santos & Moura, 2021). As a result, escape rooms could be defined as a preset of game elements frequently implemented together within educational settings, often involving challenges, roles, cooperation, and competition, yet not games given their lack of internal consistency rules (Rodríguez-García et al., 2021).

Gamified interventions need to be designed considering the target users and their specific sociocultural context (Fernández et al., 2023). As Lim et al. (2022) describe, every curricular area is prone to potential gamification, however, each subject benefits more from certain game elements, such as social sciences and humanities disciplines, which benefit from the implementation of narrative, or puzzles and challenges in the teaching and learning of science and technology.

Evaluating which curricular areas are the most frequently involved within gamification proposals, as well as how the game elements within them are interconnected can greatly inform and boost potential evolutions within the gamification research field, which

has already been subject to partial updates based on how digital games have progressively evolved within the digital industry (Werbach & Hunter, 2020), as well as how gamers interpret, enjoy and participate within their ad-hoc virtual worlds.

1.1.1. Benefits and risks of implementing gamification

One of the main reasons that have led gamification to be one of the most frequently implemented active methodologies across multiple educational stages relies on its reported great benefits regarding the reinforcement of intrinsic motivation and learning self-efficacy (Alonso-García et al., 2021). Complementarily, Bachiri et al. (2023) affirm that using this methodological approach can optimize learning as well as considerably reinforcing a pupil's grades. These findings, as Lampropoulos and Kinshuk (2024) and Ekici (2021) indicate, appear to be consistent from Primary to Higher Education.

However, inadequate and/or rushed design of gamification-based experiences may actually end up in generating detrimental social relationships or classroom environments based on aggressive competition, inferiority complexes, low self-esteem in face of feeling left behind by better-scoring pupils, that could be deeply detrimental to users' progress and experiences (Queirós & Pinto, 2022). This dichotomy calls for further research on how gamified proposals may influence students' learning results in the context of the Primary Education stage, characterized by the still in development emotional intelligence of its students (Priego-Ojeda et al., 2024).

Moving on to influences on student engagement, gamification has been proven to be an ideal methodology in favoring behavioral and attitudinal changes regarding both civic actions and compromise towards work-related or academic responsibilities (Krath et al., 2021). Nevertheless, authors such as Sánchez-Gutiérrez et al. (2023) or Trujillo-Torres et al. (2021) claim that, despite the existence of these findings, the innate playful character of gamified activities could potentially cause severe distractions in the average pupil and nullifying any beneficial behavioral effect as a result. These apparent contradictions call for a deeper interpretation of how effective gamification can be in fostering an improvement regarding attitudinal aspects within Primary Education children, specially taking into consideration their already naturally limited attention span, as authors such as Rosati et al. (2024) have already proved that capturing pupils' interest through gamified, interactive content can lead to a prolonged maintained focus.

Furthermore, this methodology has been proven to show a rapid decadence of its innate benefits as time goes by, relatively recovering after the students get familiarized with its design bases but ending up in non-significative effects over their academic achievement, and even negative influence in relation to their motivation and satisfaction (Rodrigues et al., 2022a). These aspects, however, have been vaguely studied and evidenced as longer interventions are not common when applying a gamification methodology in Primary Education nor in other stages.

As pointed out by Fiuza-Fernández et al.'s (2022) study, Primary Education teachers do not to consider themselves well-versed in the implementation of gamification apart from merely being aware of its meaning. This reality eventually leads to an abusive use of technological tools designed to gamify exposition-reception-based lectures (Krath et al., 2021) which, apart from being in opposition to the overall lack of educational resources nowadays (Alahmari et al., 2023), only aids in justifying and favoring lacking both the didactic knowledge and teaching-planning skills to carry out true gamified proposals without the external aid of this recently developed software. Evaluating the degree in which gamified practices deeply rely either on specific software or hardware can be a topic of interest with regard to potential practical implications aimed at improving the training quality of future educators.

1.2. Literature review

Although gamification has consolidated its influence across educational stages and environments, attention should be equally paid to the design philosophy behind the items that inspired and initially originated the birth of gamification as a field of research: videogames. Therefore, in order to robustly define research objects that could offer potential interest to scholars and practitioners alike, a literature review that addresses both of these dimensions is in order as to navigate such a field characterized by its celerity of production, development, and implementation.

1.2.1. Diversity and variety within videogame design

In an analogous manner to how most of the existing game genres are built around a common set of familiar elements to the player, certain game elements utilized within the gamification methodological framework hold a more significant prevalence of use than others. Apart from that, scholars such as Bar and Otterbring (2021) and Šisler et al. (2017) indicate that game elements, and consequently the players' preferences, implemented in videogame design, partially influenced by global tendencies, are intertwined with cultural views and ideals, therefore potentially varying between different sociocultural settings, even within the very same country. Sotamaa (2021) further complements these insights by establishing that every design studio may develop their own design culture, determined by both contextual indicators of a cultural origin, frequently implemented in an unconscious and implicit way, and tendencies born out of the designers' own usual *praxis*.

In the light of these statements, Elmezeny and Wimmer (2018) establish the necessity to study the existence of game design cultures at a *meso*, transnational cooperative, level, in order to determine the existence of patterns regarding game preferences both between players and creators. As shown by Bar and Otterbring (2021), gamers raised within an American culture tend to introduce elements linked to luck, while European users rather tend to implement strategy and logical thinking in their game designs. Supporting such conclusions, a report on the history of game development contextualized in four of its main hubs developed by Özalp (2024), shows that Finland predominantly produces interactive and social videogames for mobile devices, while Poland focuses on text-based and story-drive projects aimed at Personal Computers (PC). Additionally, as these authors state, Japan has always followed a pay to play tendency regarding their game design, starting with arcades, nowadays embodied in the so-called *gacha* games, while the US' main target product is none other than heavy-duty PC games, mostly due to being host to some of the most worldwide relevant hardware

engineering enterprises.

However, these differences may not only be limited to geographical limitations, but also of a temporal nature. Several industry-changing situations can be pinpointed when studying the evolution of gaming history. Changes regarding improvement of hardware capabilities seemed to have described an evolutionary line starting with arcade and platforming games between the 1980′s and 90′s, changing into the dominion of simulation, including role-playing and sport games, up until the early 2000′s, and eventually conforming the open-world era with extended adventures, frequently built upon a shooter game-based engine (Clement, 2024; Qaffas, 2020; Tongue, 2021).

Tendence prevalence regarding videogames and playstyles lacks consistent representation, both due to the absence of systematically conducted reports gathering data through various years and differentiated by sociocultural contexts, as well as the use of different measures such as game revenue, sales or player count, videogame press companies have always been one of the main referents regarding the matter. As illustrated by Wallach (2020), the birth of mobile gaming completely reshaped the players' purchasing and gaming tendency, as it was the exact point in history where arcade games started their decay, mobile games started their rise to the top of the revenue chain, while PC and Console games remained relatively stable, giving place to more exploration-based and socially dynamic products (Özalp, 2024)

Such a dramatic change of medium, platform, tends to cause a change of preferred game genres. Following this line, although sport and action games have always been the two most popular game categories, being this a fact that still stands to this very day (Videogames Europe, 2023), over the last decades certain genres such as adventure, shooter and role-playing games have fluctuated in popularity until having conformed a quite well-established popularity base (Asociación Española de Videojuegos [AEVI], 2024; Clement, 2024; Qaffas, 2020; Sundararajan, 2022; The Independent Games Developers Association [TIGA], 2016). This generally global agreement between reporters, organizations and enterprises has been further supported by the *Upcoming Gaming Trends* report developed by Google for Games (2023), in which both with a global and regional scope single player extended missions deeply based on plot and further lore is the most popularly supported type of gameplay. Conversely, a recent scoping review conducted by Cole et al. (2024) revealed that Secondary Education teachers tend to implement fast-paced competitive minigames in their applications of Game-Based Learning, which drastically contradicts the general gaming tendency of the recent years. Considering that, to the authorial team's knowledge, no review has been conducted regarding game element tendencies in gamification approaches, it is of scientific and practitioner interest to examine of Primary Education methodological designers adapt their educational interventions to the users' current preferences or opt for old-school inspired design ideals.

1.2.2. Design patterns in gamified primary education

Within the specific context of Primary Education, one of the most common gamification elements is points, in its diverse applications, highlighting token economy model such as the one developed by Yassine and Tipton-Fisler (2022), in which 574 Early Childhood Education and Primary Education students took part, giving them units as a reward for showing prosocial conducts, resulting in an overall notable bettering of the state of convince in the institution.

This kind of exchange may hint at the existence of further interconnections between elements of a different nature that, when implemented in unison, could lead to unique learning results accomplishable on their own. These interactions are further addressed in Sotos-Martínez et al.'s (2023) study, in which *ClassDojo* was used in the Physical Education area with a total of 72 fifth and sixth grade students, establishing goals based on points that allowed the learner to personalize their own avatar, obtaining improvements regarding intrinsic motivation towards the subject at hand.

The use of badges, although with a lower rate of implementation, is equally relevant in the studied educational stage. An intervention based on healthy habits and diet developed by Gómez-García et al. (2020) can be highlighted in this field, using a sample of 202 sixth-grade learners, significantly improving their autonomy, motivation towards learning and self-regulation in the researched subject. These findings, however, could potentially point towards gamification leading to educational benefits exclusively based on extrinsic motivation, i.e. obtaining external rewards not linked to self-joy or progress feeling within any given educational context, therefore contradicting Alonso-García et al.'s (2021) claims on gamification being a catalyst of intrinsic motivation.

Evidence of the standalone use of leaderboards is non-existent in Primary Education. It is worth mentioning, within a Secondary Education context, an intervention implemented by Alsadoon et al. (2022), in which clear motivational improvements were found, in the absence of any influence on grades, taking a 133 13- and 14-year-old student sample and using the leaderboard as a competitive element. This experience could validate the previously described research line based on augmenting potential focus losses due to great interest on the implemented methodology, at the cost of not significant, or even detrimental, learning results. Such result could be derived from excessive use of playful elements of already-reported effective educational tools such as feedback, potentially misleading their influence, output and result (Banihashem et al., 2022).

1.3. Previous literature reviews and justification of the present study

Although certain systematic reviews have already attempted addressing such complex research reality around gamified educational practices, most tend to be ominously centered around Higher Education (Alahmari et al., 2023; Ekici, 2021; Lampropoulos & Kinshuk, 2024). This could lead to inadequate generalizations of the already existing literature given the strong negative correlation existing between users' age and/or psychological maturity and benefits derived from having undergone a gamified learning session (Parra-González et al., 2021)

This call for further deepening in the reality of gamification applied to the instruction of young learners is further reinforced by the fact that, when focusing on Primary Education, reviews such as the one conducted on Guan et al.'s work (2024) opt to use a vague

definition of gamification, overlapping it GBL as previously outlined. As stated by Vrcelj et al. (2023), these practices lead to research gaps on the effectiveness of *actual* gamification practices in the educational stage of interest to this study.

As Sailer and Homner (2020) discovered, the cognitive benefits derived from its use appear to be stable, although insignificant, while its influence over motivational and behavioral aspects appears to be more variable between different experimental reports. Although the study conducted by Chi-San et al. (2022) affirms that competitive gamification allows for a relevant learning improvement over its collaborative counterpart, their findings are limited to works published up to 2019 and in relation to the whole spectrum of educational stages. This shows the need to expand the body of knowledge related to the influence and prevalence of game elements in gamification interventions, among which the cooperation-competition duality is one of the most influential, common, and relevant mechanics.

Following the aforementioned proposal, Costa (2023) studied the influence of diverse game elements in the teaching and learning of programming with young learners and adults, determining that only the use of levels returned significant results, reaffirming the need for further research in relation to that factor amongst school children. These notions reinforce the interest and value of configuring an updated vision on the use and conception of gamification in Primary Education given how relevant the motivational factor is when developing gamified interventions. As Li et al. (2024) point out, the key component in the success of a gamification proposal is none other than the extrapolation of the extrinsic motivation generated by the learners' interests in the general enjoyment of the experience and obtention of external rewards, towards intrinsic motivation connected to the joy of learning itself.

Regarding the study of game element implementation, the systematic review conducted by Noroozi et al. (2020) reveals that, in GBL educational approaches and from a mechanical point of view, feedback, collaboration and challenges were the most frequently implemented game-inspired aspects. According to the study, focused on game components, conducted by Buckley et al. (2019), around 80 % of experiences included points and achievements in their design, while other game elements such as boss fights and tangible rewards end up in overall lack of use and decadence. Additionally, as these authors indicate, the relevance and ease of implementation of the so-called PBL triad (Points, Badges, and Leaderboards) could determine the extent to which complementary game elements are present within gamified sessions.

To the authorial team's knowledge, no study has tried delving into the world of game elements implemented within gamification approaches involving the element triad established by Werbach and Hunter (2020). Therefore, and considering how closely tied these two game-related research fields are, analyzing potential patterns between implemented game elements in gamification proposals according to country of origin and in reference to timely evolutions in gaming tendencies may return valuable conclusions proving, or not, if practitioners and scholars get inspired by game elements based on their place of precedence and sociocultural reality.

1.4. Research objective and questions

Given the previously detailed background, the main goal of this literature review is to analyze the reality of the integration of gamification in Primary Education, determining the existing evidence about its influence over the students of the stage's learning results. In order to vertebrate this study, as well as to focalize the research procedure, the following research questions are established:

- RQ1. How many studies about the application of gamification in the stage of Primary Education were published between 2020 and 2024, and how are they geographically distributed?
- RQ2. Which game elements and technological resources are used in the gamification experiences developed in Primary Education?
- RQ3. In which Primary Education curricular areas are gamification experiences developed and what general outcomes derived from them?

2. Methodology

To fulfill the goal of the present study, as well as to answer the previously established research interrogatives, a systematic review of the existing literature regarding gamification in Primary Education was conducted.

This research methodology consists in, following Higgins and Green (2008), the compilation and collation of existing empirical evidence in relation to any given theme according to a series of pre-established objectives, using an explicit and systematic work methodology that minimizes the risk of bias in the process. It allows researchers to obtain trustworthy and robust results from which valuable conclusions and findings of quality and interest can be withdrawn.

Additionally, with the intention of guaranteeing rigor and replicability throughout the whole research process, this revision has been developed under the guidelines of the PRISMA, *Preferred Reporting Items for Systematic reviews and Meta-Analyses*, statement (Moher et al., 2009), reviewed and updated by Page et al. (2021).

Therefore, this revision has been structured starting with a *planning* stage, in which the research objective and questions were defined along with the descriptors to use and databases to consult. The inclusion and exclusion criteria to be applied to the retrieved registers were determined in this initial moment as well. After that, an *action* stage took place, including an initial search in the selected repositories, the refinement and reducing of the returned registers thanks to the application of the aforementioned criteria, ending with the selection of the final study sample.

2.1. Search strategy

The search process was centered around the Web of Science, henceforth WOS, and Scopus, given their ample international

acknowledgement within the research field of Social Sciences, as well as the subsequent informational quality and scientific relevance of their indexed publications. The search string that was to be introduced in both databases was configured based on the key concepts of *gamification* and *Primary Education.*

On one hand, synonyms and related terms derived both from thesaurus of international recognition and interest, such as the UNESCO thesaurus and the one integrated in ERIC, were included in this string in relation to courses within Primary Education in order to avoid limitations regarding name or age range between different countries, as to conform a worldwide study sample of international interest.

On the other hand, given that gamification is a specific term itself, thesauruses were not able to provide synonyms or linked terms. Therefore, terms associated both with certain popular game elements used in gamification approaches, as well as names of relevant and worldwide acknowledged gamification tools and methodological concretions, as compiled in Gómez-García et al.'s (2021) work, were used in order to gather as much existent evidence about the implementation of this methodology. Given that, as it was previously discussed, there is a low academic consensus about the notion of gamification itself, measures like this are of relevance to gather every published paper that, explicitly or not, addresses it.

The definitive search string, taking into account all these aspects, was: (gamif* OR classdojo OR knowre OR edmodo OR "escape room" OR "break out" OR badges OR leaderboard*) AND ("primary education" OR "primary school" OR "elementary education" OR "elementary school" OR "early childhood education" OR "preadolescents" OR "middle school" OR K-12 OR first-grad* OR second-grad* OR third-grad* OR fourth-grad* OR fifth-grad* OR sixth-grad*).

Additionally, a series of inclusion and exclusion criteria were applied to the retrieved results with the purpose of narrowing down the initial study pool and configuring a rigorous final sample of quality and relevance to the purposes of this study. These criteria are specified in Table 1.

2.2. Data collection and analysis

The information compilation and screening process that sustains this systematic review was developed during May 2024, being structured in four different phases, which have been graphically portrayed, following the PRISMA 2020 requirements (Page et al., 2021) in Fig. 1 in the form of a flowchart that illustrates the number of registers analyzed in each stage, as well as the discarded works at the end of each section as well as the reasons for their elimination from the contemplated study sample.

The first phase, *identification*, involved introducing the previously stated research string in the selected databases. Of the initial 1406 retrieved registers, 404 duplicates were removed as they were indexed in both of the consulted repositories.

The second phase, *screening,* was divided into three distinct instances. Firstly, thanks to the filters included within the search engines of the WOS and Scopus databases, the inclusion and exclusion criteria related to year, language and category of publication (IN1, IN2, IN3 and EX1, EX2, EX3) were automatically applied, resulting in discarding a total of 665 registers. After that, the research team proceeded to retrieve the full text of the remaining registers, which derived in discarding 11 works due to the impossibility of obtaining their full publication text. In a third instance, in possession of 324 full text registers, the team proceeded to evaluate their eligibility for the purposes of this literature review while applying the remaining inclusion and exclusion criteria.

In order to fulfill this task, and to avoid any potential selection bias, each one of the four authors of this paper took on the task of independently analyzing the eligibility of the remaining registers. Authors agreed and were therefore tasked with marking those registers that, due to the nature of their content or presentation, were not clear candidates at first regarding their selection for the final

Table 1
Inclusion and exclusion criteria.

Inclusion criteria (IN)	Exclusion criteria (EX)
IN1: Articles	EX1: Books, book chapters, congress proceedings, and other non-peer-reviewed editorial materials
IN2: Works published in the last five years (2020, 2021, 2022, 2023, 2024)	
IN3: Language must be either English or Spanish	EX2: Works published before 2020
IN4: Empirical studies	EX3: Language different from English and Spanish
IN5: Student sample between 6 and 12 years old, both included	EX4: Theoretical studies
IN6: Gamification experiences	EX5: The sample involves educators, the age is not specified, or it is not between 6 and 12 years old
	EX6: Experiences unrelated to gamification, or that do not specify the game elements that were used

Reasoning behind the established criteria

The present study exclusively considers articles published in the last five years (IN1 and IN2) given the need for recent and updated findings in order to update the state of gamification in the target educational stage described in earlier systematic literature reviews (Chi-San et al., 2022). Considering English and Spanish as the only valid publishing language for this study sample (IN3) aims at establishing an international range of experiences that is of relevance and interest to an international community, given that both are some of the most extensively used languages in educational research all around the world.

This research opts to focus on the age range between six and twelve years old (IN4), as well as in experiences that have been designed under a gamification methodological framework (IN5), given its main goal of studying the state and prevalence of use of this methodology in Primary Education, often established around those age limits taking into account the institutional structure of most countries worldwide. The consideration of only experiences that clearly establish the game elements that were utilized in their design (IN6) has the sole purpose of guaranteeing the quality and integrity of this systematic review since, as previously stated, numerous non-gamified experiences tend to use this denomination under a terminological confusion, often in relation to Game-Based Learning.
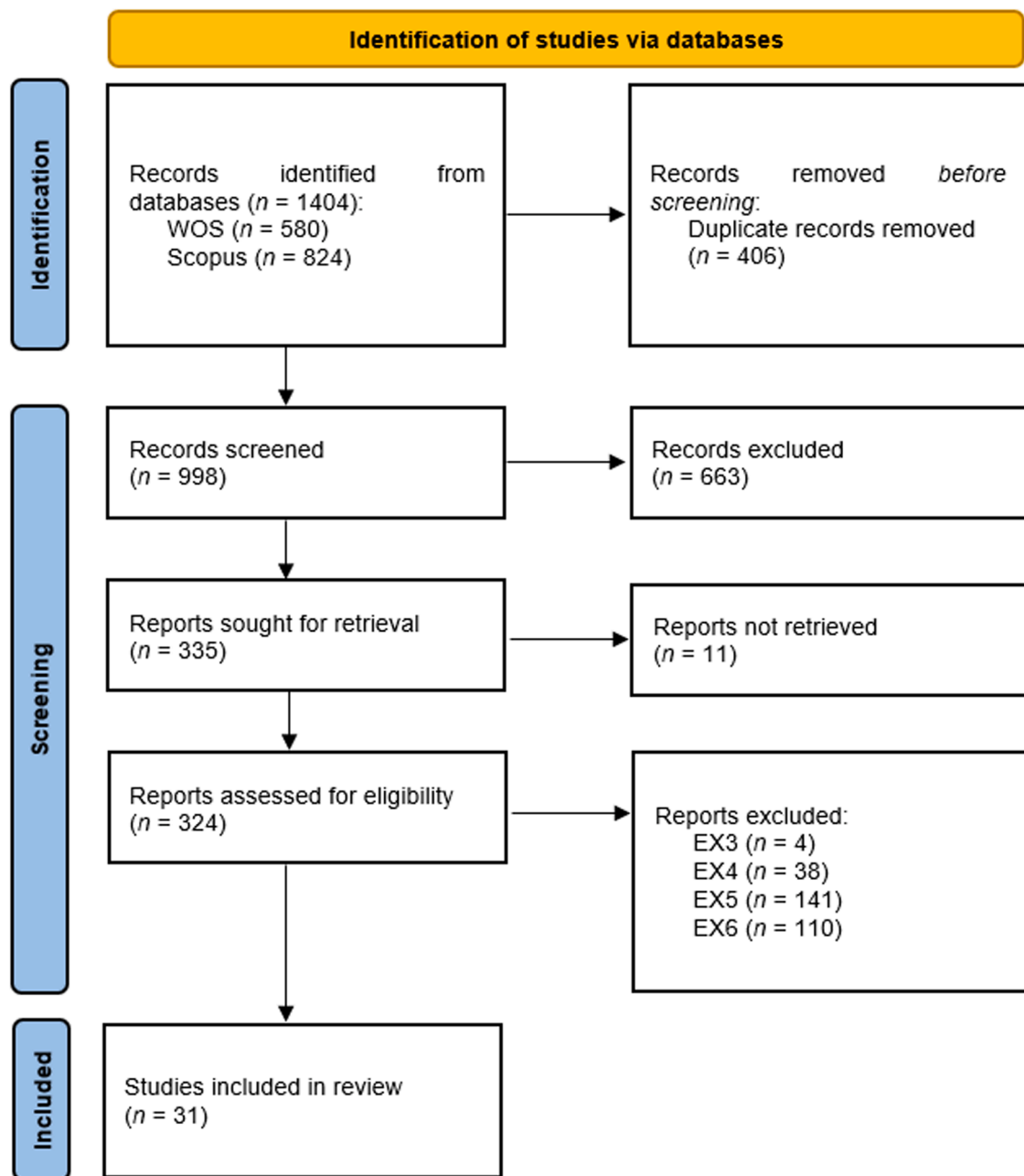
Note. Authors' own work.

Fig. 1. Flowchart illustrating the filtering process
Note. Authors' own work, based on Page et al. (2021).

study sample.

Once every author had already reviewed all 324 studies, each individual shared information regarding the studies that were discarded according to their judgement, in order to make sure that no personal eligibility bias could affect the configuration of the final study sample. Although the authors had discarded almost the exact same publications in their individual evaluation processes, there were four registers that derived in disagreements within the work group, all related to the application of the IN6 and EX6 criteria, that is, determining if the interventions were or not gamified proposals.

These situations were eventually solved on the basis of informed dialogue in relation to the notion of gamification and the game element framework established by Werbach and Hunter (2020). The integrity of this process was conducted through the saving and sharing of bibliographic libraries using the Zotero reference manager software.

Selection or discarding of studies were based on reading their metadata and abstract in order to apply the more superficial inclusion

and exclusion criteria regarding the empirical character of each research study (IN4 and EX4), resulting in 38 discarded registers. After that, and only if registers positively fulfilled the aforementioned criteria, scanning their full text was in order to evaluate their eligibility regarding design-related criteria, including sample age and characteristics (IN5 and EX5), discarding 141 articles, and the gamified nature of the conducted experiences (IN6 and EX6), eliminating 110 additional registers.

All four authors, however, reported the need to manually consider the criteria regarding publishing language (IN3 and EX3) in this phase, discarding four extra studies that were inadequately indexed in the consulted repositories, including two studies written in Portuguese and two studies written in Turkish. This was the last action that led to the configuration of the final study sample ($n = 31$).

2.3. Validity

Once the studies regarding gamification experiences developed in Primary Education had already been identified, screened and assessed for eligibility to be included in the final study sample of the present work, the authors deemed necessary, especially considering the apparent coexistence of a variety of gamification conceptions, to analyze the quality, rigor and validity of the considered works.

To achieve this, the authors evaluated the 31 remaining registers using the *Mixed Methods Appraisal Tool*, developed by Hong et al. (2018). The present authors determined that, in order to configure a representative study sample that could potentially include any school of thought regarding educational research with an international scope, research hypotheses and objectives were considered valid in the evaluation of the screening questions of the tool based on the presence and quality of research questions.

In order to, again, avoid any selection bias regarding the evaluation of the remaining studies while using this tool, each researcher analyzed the preliminary final sample of 31 studies independently, checking each item of the aforementioned tool. After that, a group discussion took place, in which every author shared their views on the analyzed articles, proceeding to solve any discrepancies or uncertainty about the inclusion of any given work through dialogue and discussion.

This last scenario took place regarding two mixed methods studies that did not appear to follow quality criteria for qualitative and quantitative studies (Rodríguez et al., 2020; Sipone et al., 2021), two articles following a quantitative non-randomized methodology using a sample that did not seemed to be representative of the target population (Paknejad et al., 2021; Solano et al., 2024), and two qualitative works that did not use clear research questions and/or objectives and/or hypotheses (Piñero, 2020; Santos-Calero & Cañadas, 2023). A breakdown of this evaluation process can be found in Table 2.

Table 2
Outcome of the application of the Mixed Methods Appraisal Tool.

Work	Method	S1	S2	C1	C2	C3	C4	C5
Alebaikan et al. (2022)	Qualitative	Y	Y	Y	Y	Y	Y	Y
García-Tudela et al. (2020)	Qualitative	Y	Y	Y	Y	Y	Y	Y
Lee and Lai (2024)	Mixed methods	Y	Y	Y	Y	Y	Y	CT
Moreno et al. (2023)	Mixed methods	Y	Y	Y	Y	Y	Y	N
Ocaña et al. (2023)	Quantitative non-randomized	Y	Y	Y	Y	N	Y	Y
Piñero (2020)	Qualitative	N	Y	Y	Y	Y	Y	CT
Ríos et al. (2020)	Quantitative non-randomized	Y	Y	Y	Y	Y	Y	N
Sayed et al. (2023)	Quantitative randomized control trials	Y	Y	Y	Y	Y	CT	Y
Alshammari (2020)	Quantitative randomized control trials	Y	Y	Y	Y	Y	CT	Y
Boggio et al. (2023)	Quantitative randomized control trials	Y	Y	Y	Y	Y	Y	Y
Chen et al. (2020)	Quantitative randomized control trials	Y	Y	Y	Y	Y	CT	Y
Prados et al. (2021)	Quantitative non-randomized	Y	Y	Y	Y	Y	Y	Y
Ruiz-Bañuls et al. (2021)	Quantitative non-randomized	Y	Y	Y	Y	Y	CT	Y
Solano et al. (2024)	Quantitative non-randomized	Y	Y	CT	Y	Y	CT	Y
Dos Santos and Vélez (2021)	Mixed methods	Y	Y	Y	Y	N	Y	Y
Li et al. (2022)	Mixed methods	Y	Y	Y	Y	Y	Y	Y
García and Fernández (2022)	Quantitative non-randomized	Y	Y	Y	Y	Y	N	Y
Gómez-García et al. (2020)	Quantitative non-randomized	Y	Y	Y	Y	Y	Y	Y
Leong et al. (2024)	Quantitative non-randomized	Y	Y	CT	Y	Y	Y	Y
Tirado-Olivares et al. (2021)	Quantitative non-randomized	Y	Y	Y	Y	Y	CT	Y
Zourmpakis et al. (2023)	Quantitative non-randomized	Y	Y	Y	Y	Y	Y	Y
Martínez-Hita et al. (2024)	Quantitative non-randomized	Y	Y	Y	Y	Y	CT	Y
Morales et al. (2024)	Quantitative non-randomized	Y	Y	Y	Y	Y	Y	Y
Rodríguez et al. (2022a)	Mixed methods	Y	Y	Y	Y	Y	Y	Y
Santos-Calero y Cañadas (2023)	Qualitative	N	Y	Y	Y	Y	CT	Y
Sotos-Martínez et al. (2023)	Quantitative non-randomized	Y	Y	Y	Y	Y	Y	Y
Paknejad et al. (2021)	Quantitative non-randomized	N	Y	CT	Y	Y	Y	Y
Rodríguez et al. (2020)	Mixed methods	Y	Y	Y	Y	Y	Y	N
López et al. (2021)	Quantitative non-randomized	Y	Y	Y	Y	Y	CT	Y
Sipone et al. (2021)	Mixed methods	Y	Y	Y	Y	Y	Y	N
Sipone et al. (2023)	Mixed methods	Y	Y	Y	Y	Y	Y	Y

Note. Authors' own work, based on the template and tool provided by Hong et al. (2018). *S1* and *S2* stand for the screening questions of the tool. *C1, C2, C3, C4* and *C5* refer to the applied criteria, varying based on the method employed in the development of the referred works. *Y* = Yes; *N* = No; *CT* = Cannot Tell.

In the end, as these articles were deemed of overall pertinent quality and rigor, the preliminary study sample remained the same and became definitive, as most works were able to stand for every applied criterion, except for a few that missed only one check aspect and were, therefore, considered of integrity and quality. As a result, the final and definitive study sample of this review contains a total of 31 works, whose details and main characteristics can be accessed in a summed-up way in Table 3.

3. Results

The information hereby presented is organized in a way that allows us to give individual answers to each and every one of the previously stated research questions. It is worth mentioning that both Tableau (Tableau Software, Seattle, WA, USA, version 24.1.1062) and OriginLab (OriginLab Corp., Northampton, MA, USA, version 10.15.132), as graphic editing software, have been used in order to create and design the various images that illustrate these data.

3.1. Temporal and geographical distribution of the study sample

As shown in Fig. 2, 22.58 % ($n = 7$) of the final study sample was published during each year of the 2020–2021 biennium. This stable tendency, however, drastically descends during the 2022 publication year, having recovered a total amount of $n = 4$ (12.90 %) published studies. Nevertheless, a peak of eight (25.81 %) published gamification works related to Primary Education is achieved during 2023, leaving the current publishing year, 2024, with the last five (16.13 %) articles of the study sample.

These results show an overall rising tendency in publishing articles about the matter is clearly reflected as time goes by, with the punctual exception of the minimum publishing point perceived during 2022, while 2023 is the year with the highest indexation count ($n = 8$).

As shown in Fig. 3, which offers a visual and contextualized representation of the geographical distribution of the study sample, three wide areas of influence or blocks distributed all around the globe can be explicitly defined.

A certain concentration of studies developed in Spain can be appreciated, representing about the 48 % of overall analyzed studies ($n = 15$). The rest of the European facet of the final sample is formed up by a study developed in Greece and another one in France, representing a total 55 % of the final study sample ($n = 17$).

Additionally, a nucleus of gamification experiences can be established throughout Asia, representing a 26 % of the final sample ($n = 8$), including countries in which only one study has been carried out, such as Egypt, Iran, China, and Singapore; as well as Saudi Arabia and Taiwan, which have participated in two studies each. A third publishing block can be defined around South America, led by Ecuador with three gamification experiences, and including one study developed in Peru, another one in Chile, and another in Mexico. In this way, the last 19 % of the sample ($n = 6$) is characterized.

3.2. Which game elements and technological resources are used in the gamification experiences developed in primary education?

The final study sample shows wide variety regarding the use of resources and/or materials in the development of the described experiences. 29,03 % of the sample is centered around analogical gamification ($n = 9$), without any kind of technological aid or support, while the other 70,97 % of works ($n = 22$) is divided between experiences based on the use of software designed by publishing groups, *ad-hoc* or created by the authors of the studies themselves, and commercial applications developed by third parties.

Regarding hardware, only one article uses smartphones, four use tablets, five opt for the use of personal computers, while twelve affirm and explicit the use of technological devices, yet they do not specify any kind of product in particular. Fig. 4 shows a visualization of the applications used in the analyzed experiences, along with their respective frequency of use.

A clear dominance of achievements can be appreciated in the final study sample, as shown in Fig. 5, acting as the main game component linked to progress, appearing in 83,87 % ($n = 26$) of the selected articles, followed by levels ($n = 15$; 51,61 %) and quests ($n = 12$; 38,71 %), tending to appear jointly with other progress-related components. It is worth noting that the progress bar has a characteristically low frequence of use in this field ($n = 9$; 29,03 %), as well as the influence of points, a competitive component, over levels, coinciding in 76,47 % ($n = 13$) of the works that use them as a progress component.

Regarding the component-mechanic links (CML) of this group, the three most implemented mechanics via the appearance of the aforementioned components are rewards ($n = 70$, CML; 23,03 %), followed by feedback ($n = 61$ CML; 20,07 %) and challenges ($n = 51$ CML; 16,78 %). In this way, it can be affirmed that progress is, in a second instance, catalyzed by rewards. associated with given milestones, leading to positive or negative feedback after advancing through the intervention, and varying in difficulty by challenge-based pace-changing barriers. A visualization of these connections can be seen in Fig. 6.

Points position themselves as the essential component associated with score and activity organization ($n = 22$; 70,97 %), being teams ($n = 13$; 41,94 %) and time constraints ($n = 8$; 25,81 %) the second and third most common components, respectively. Unlike what could be perceived in the progress group and is it is appreciated in Fig. 7, there is a lack of homogeneous use of these components, with the exception of points, observing a clear intragroup interdependence as this component appears in most studies where any challenge-competition component is used, highlighting the coincidence of a 100 % with negative score ($n = 6$), of a 85,71 % ($n = 6$) with leaderboards, and of a 76,92 % in studies using teams ($n = 10$). Combat is only used in a single experience, while boss fights lack any kind of representation in the final study sample.

Although the overall number of connections between mechanics and components decreases in this component group, it can be highlighted how both rewards and feedback have an identical prevalence in the field ($n = 50$ CML; 19,92 %), as if the act of receiving a reward when it comes to completing hard tasks of an intervention acted as a sign of feedback itself, which is supported by challenges

Table 3
Breakdown of the main characteristics of the compiled gamification experiences developed in Primary Education.

Work	Location	Curricular area	Sample (n)	Game elements (based on Werbach & Hunter, 2020)			Main results
				Components	Mechanics	Dynamics	
Alebaikan et al. (2022)	Saudi Arabia	Mathematics - Programming	$n = 13$ twelve-years-old girls	Points, time constraints, levels, badges, leaderboards, achievements	Rewards, feedback, competition	Progression, emotions, constraints	Academic commitment and motivation improved due to extrinsic motivation built upon points and badges
Alshammari (2020)	Saudi Arabia	Linguistics (Arabic)	$n = 58$ sixth grade students $n = 30$ control group; $n = 28$ experimental group	Progression bar, levels, content unlocking, achievements	Feedback, rewards	Progression	Superior learning results in matters of style, classification, and grammar. Relevance and satisfaction towards learning were significantly reinforced, unlike attention and confidence
Boggio et al. (2023)	France	Linguistics (French)	$n = 311$ six-eight-years-old students $n = 69$ control group; $n = 81$ experimental group	Levels, leaderboards, progression bar, content unlocking, infinite gameplay, social graph, quests, achievements	Feedback, rewards, competition	Relationships, emotions, progression	It was not possible to obtain significative improvements in relation to phonologic awareness nor reading. There was a non-significative improvement of orthography. The lower the base level, the more influential gamification is
Chen et al. (2020)	Taiwan	Linguistics (Chinese)	$n = 55$ fifth grade students $n = 27$ control group; $n = 28$ experimental group	Points, avatars, negative scoring, virtual goods	Rewards, feedback, resource acquisition, competition	Progression, Emotions	The quantity of reading annotations significantly increased, but their quality did not. There was an improvement in commitment towards reading as well as its commentary and discussion.
Dos Santos and Vélez (2021)	Ecuador	Foreign Language (English)	$n = 29$ sixth grade students	Achievements, combat, search and discovery	Cooperation, challenges	Narrative, progression	Significative improvement of motivation and participation after following an e-learning program. Learners used points as an indicator for academic performance, showing confidence in their progress
García and Fernández (2022)	Spain	Natural Sciences	$n = 38$ six-seven-years-old students $n = 17$ control group; $n = 21$ experimental group	Time constraints, teams, achievements, collections	Cooperation, competition, resource acquisition, feedback, win states	Narrative, relationships, constraints, emotions	Adherence to mediterranean diet improved but not significantly, without any influence based on the user's gender
García-Tudela et al. (2020)	Spain	Mathematics	$n = 24$ third-grade students	Badges, levels, achievements, collections, quests	Challenges, rewards, resource acquisition, feedback	Progression	Participation and compromise both improved among proactive learners. Cooperation was affected by primacy of extrinsic motivation

Table 3 (*continued*)

Work	Location	Curricular area	Sample (n)	Game elements (based on Werbach & Hunter, 2020)			Main results
				Components	Mechanics	Dynamics	
Gómez-García et al. (2020)	Spain	Natural Sciences	n = 202 sixth grade students	Teams, points, avatars, negative scoring, virtual goods, search and discovery, gifting, achievements	Challenges, cooperation, turns, rewards, feedback, resource acquisition	Progression, relationships	Combining gamification with flipped learning returned generally high learning results regarding self-regulation and motivation
Lee and Lai (2024)	Taiwan	Mathematics	n = 52 fifth grade students. n = 26 control group; n = 26 experimental group	Points, badges, achievements, levels, tangible rewards, search and discovery, progression bar	Rewards, resource acquisition, feedback	Progression	Academic performance, participation and motivation significantly increased. Learners had better learning achievement feelings as well as knowledge about their expectations
Leong et al. (2024)	Singapore	Natural Sciences	n = 1440 nine-twelve years-old students	Leaderboards, achievements, points, badges, tangible rewards, collections, teams	Challenges, rewards, competition, cooperation, win states, feedback, resource acquisition	Constraints, relationships, narrative, progression	The number of travels by car significantly decreased. Intrinsic motivation regarding the avoidance of cars improved significantly in the group that implemented narrative
Li et al. (2022)	China	Foreign Language (English)	n = 94 third grade students	Levels, points, avatars, leaderboards, tangible rewards, progression bar, collections, achievements	Challenges, feedback, rewards, resource acquisition, competition	Progression, emotions	Proficiency in a language and self-regulation especially improved in learners with a lower initial level. Students show generally good disposition towards gamification, developing self-regulation strategies
López et al. (2021)	Peru	Transversal	n = 60 ten-twelve-years-old students n = 30 control group; n = 29 experimental group	Achievements, tangible rewards, levels, gifting, search and discovery	Challenges, rewards, cooperation	Progression, relationships	Motivation significantly improved as well as self-efficacy, attitude, and self-regulation. There was not a significative improvement of academic achievement when compared to a traditional control group
Martínez-Hita et al. (2024)	Spain	Social Sciences	n = 44 fourth grade students n = 21 control group; n = 23 experimental group	Quests, badges, tangible rewards. levels, points, avatars, negative scoring, achievements	Challenges, rewards, feedback, resource acquisition	Narrative, progression	An improvement in the students' commitment could be observed, even if there was not a significative improvement of their motivation
Morales et al. (2024)	Chile	Physical Education	n = 25 third and fourth grade students	Avatars, points, content unlocking, teams, badges, virtual goods, achievements	Challenges, competition, cooperation, feedback, resource acquisition, rewards	Narrative, relationships, emotions	Motor development, locomotion and object control improved significantly

Table 3 (*continued*)

Work	Location	Curricular area	Sample (n)	Game elements (based on Werbach & Hunter, 2020)			Main results
				Components	Mechanics	Dynamics	
Moreno et al. (2023)	Spain	Mathematics	*n* = 20 second grade students	Avatars, teams, tangible rewards, achievements, quests, time constraints	Challenges, cooperation, Rewards, feedback	Narrative, relationships, progression	Learners showed receptive attitude towards the development of mathematical competences. There were certain tensions between groups and lesser convivence issues
Ocaña et al. (2023)	Ecuador	Mathematics - Programming	*n* = 137 ten-twelve years-old students	Avatars, badges, achievements, collections, quests	Challenges, feedback, rewards, resource acquisition	Progression	There was a significative improvement in the mastery of basic programming concepts. High motivation and satisfaction could be appreciated among the students throughout the experience
Paknejad et al. (2021)	Iran	Transversal	*n* = 25 Primary School students	Points, levels, leaderboards, tangible rewards, virtual goods, badges, gifting	Feedback, competition, rewards, resource acquisition, win states	Progression, emotions	Food waste was significantly reduced. Competition, commitment, and responsibility could accelerate this change
Piñero (2020)	Spain	Mathematics	*n* = 117 nine-years old students	Time constraints, achievements, teams	Challenges, cooperation, feedback, win states	Narrative, constraints, emotions	Discovery learning and motivation were favored, as well as the holding of debates between equals. There was a predisposition from the learners to inadvertently mathematize the situation at hand
Prados et al. (2021)	Spain	Linguistics (Spanish)	*n* = 86 fourth grade students *n* = 43 control group; *n* = 43 experimental group	Points, badges, achievements, avatars, tangible rewards, collections, progression bar, quests	Rewards, challenges, competition, cooperation, feedback, resource acquisition, win states	Narrative, progression, emotions, relationships	Attitude towards reading was significantly favored, specially recreative reading as well as comprehension of narrative and informative texts, when compared with a non-gamified control group
Ríos et al. (2020)	Mexico	Mathematics - Programming	*n* = 88 nine-twelve-years old students *n* = 44 control group; *n* = 44 experimental group	Points, levels, progression bar, achievements	Challenges, feedback, rewards	Progression, emotions	Learning result improved but not significatively when compared to a traditional control group. There was higher interest, compromise, and joy in the learning of algorithms
Rodríguez et al. (2020)	Spain	Natural Sciences	*n* = 25 eight-twelve-years-old students	Time constraints, points, badges, quests, avatars, leaderboards, achievements, collections	Rewards, competition, win states, resource acquisition	Narrative, emotions, progression, constraints	There was higher extrinsic motivation towards participation derived from competition, turning into intrinsic motivation in relation to energy

Table 3 (*continued*)

Work	Location	Curricular area	Sample (n)	Game elements (based on Werbach & Hunter, 2020)			Main results
				Components	Mechanics	Dynamics	
							consumption. There were no significative differences between the gamified and non-gamified versions of the app that was used.
Rodríguez et al. (2022b)	Spain	Physical Education	$n = 143$ students $n = 71$ fifth grade students $n = 72$ sixth grade students	Points, levels, progression bar, quests, badges, teams, achievements, tangible rewards	Cooperation, challenges, rewards, transactions, feedback	Narrative, relationships, progression	Motivation and physical aptitudes improved. In women, there was a reduction of perceived anxiety. There were some issues related to group work.
Ruiz-Bañuls et al. (2021)	Spain	Linguistics (Spanish)	$n = 183$ fifth grade students $n = 78$ control group; $n = 105$ experimental group	Collections, avatars, progression bar, teams, achievements, points, levels, badges, tangible rewards, quests	Rewards, cooperation, resource acquisition	Narrative, progression, relationships	Intrinsic motivation towards the subject significantly improved when compared to a control group, showing interest in grades and skill development. Students affirm that gamification favors group and cooperative work
Santos-Calero and Cañadas (2023)	Spain	Physical Education	$n = 16$ fourth grade students	Leaderboards, points, tangible rewards, teams	Challenges, cooperation, competition, rewards, feedback	emotions, progression, relationships	Motivation towards learning greatly improved, catalyzed by gamified activities and challenges
Sayed et al. (2023)	Egypt	Mathematics	$n = 39$ third grade students $n = 26$ gamification group; $n = 13$ VARK group	Virtual goods, points, progression bar, content unlocking, levels	Challenges, competition, feedback, rewards, resource acquisition	Progression, emotions	Although favorable results were obtained in relation to academic achievement, a non-gamified intervention based on different learning styles obtained better normalized gain
Sipone et al. (2021)	Spain	Transversal	$n = 75$ ten-eleven-years-old students	Avatars, quests, points, virtual goods, teams, negative scoring, levels, social graph, time constraints, achievements	Challenges, rewards, feedback, cooperation	Narrative, constraints, progression, relationships	Notable improvements regarding the concept of sustainable transport were observed. Learning result is directly proportional to the time spent and reached level within the gamification experience.
Sipone et al. (2023)	Spain	Transversal	$n = 75$ ten-eleven-years old students	Avatars, quests, points, virtual goods, teams, negative scoring, levels, social graph, time constraints, achievements	Challenges, rewards, feedback, cooperation	Narrative, constraints, progression, relationships	Women consider learning with ClassCraft easier than men and wish to use it whenever possible, even if they believe that gamification is not an ideal methodology
Solano et al. (2024)	Ecuador	Linguistics (Spanish)	$n = 37$ first grade students	Points, time constraints, achievements	Challenges, competition, rewards, turns, feedback	Emotions, constraints, progression	Reading and writing performance significantly improved
Sotos-Martínez et al. (2023)	Spain	Physical Education	$n = 72$ nine-eleven-years old	Teams, points, avatars, negative	Feedback, rewards,	Narrative, progression	There was a significative

Table 3 (*continued*)

Work	Location	Curricular area	Sample (n)	Game elements (based on Werbach & Hunter, 2020)			Main results
				Components	Mechanics	Dynamics	
			students $n = 37$ control group; $n = 35$ experimental group	scoring, virtual goods	resource acquisition		improvement regarding intrinsic motivation both in men and women, although self-regulation against extrinsic motivation did not improve at all
Tirado-Olivares et al. (2021)	Spain	Natural Sciences	$n = 24$ sixth grade students	Points, levels, avatars, content unlocking, teams, achievements, quests	Cooperation, challenges, feedback, rewards	Narrative, progression, relationships	Learners favor gamification given its playful aspect in comparison to a traditional textbook
Zourmpakis et al. (2023)	Greece	Natural Sciences	$n = 80$ third grade students	Achievements, avatars, badges, collections, gifting, levels, points, virtual goods, search, and discovery	Challenges, rewards, cooperation, competition, transactions, resource acquisition	Emotions, narrative, progression, relationships	The adaptable gamification module used during the intervention derived in high learning commitment. Intrinsic motivation-favoring elements were amongst the best valued game aspects

Note. Authors' own work.
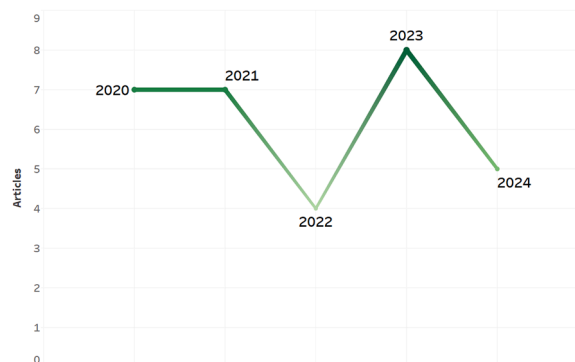
Fig. 2. Timeline of publication volume of the final study sample
Note. Authors' own work.

having a lower yet similar presence ($n = 38$ CML; 15,14 %). It is worth noting how, even if points are the most common component in this group, cooperation ($n = 34$ CML; 13,54 %) has a higher use rate than competition itself ($n = 28$ CML; 11,16 %). These connections are visualized in Fig. 8.

The rewards and identification component group is the only one in which there is no clear supremacy of a game element above others, as Fig. 9 shows, being avatars the most frequent one ($n = 15$; 48,39 %) along with badges ($n = 13$; 41,94 %), followed by tangible rewards ($n = 11$; 35,48 %). The cooccurrence within this group focalizes in cooccurrence subgroups instead of a generalized dependence or influence, therefore generating pairs or trios of elements that tend to appear in isolation from other components linked to rewards and identification. The most prominent cases of this phenomenon can be found in how collections appear in 77,78 % ($n = 7$) of the experiences in which it is used together with badges and in a 66,67 % ($n = 6$) with avatars, as well as how avatars appear in 77,78 % of the articles in which virtual goods are mentioned. Points and achievements, proceeding from earlier groups, have a strong generalized influence over this last group.

Given the nature of the components integrated in this group, rewards come to be the most common associated mechanic with the use of these components ($n = 59$ CML; 17,63 %), while feedback ($n = 50$ CML; 16,95 %) and resource acquisition ($n = 48$ CML; 16,27 %) locate themselves at send and third position respectively. Given these connections, it can be seen that, even if rewards and feedback appear to have the same kind of duality-like connection as it was already seen regarding the score-based components, it is only when rewards in form of either physical or virtual goods, such as badges or tangible rewards, come to play that the notion of acquiring resources explicitly appears in the gamified proposal. These connections can be seen in Fig. 10.

Regarding mechanics, both challenges and rewards present great representation in this typology of game elements, appearing in
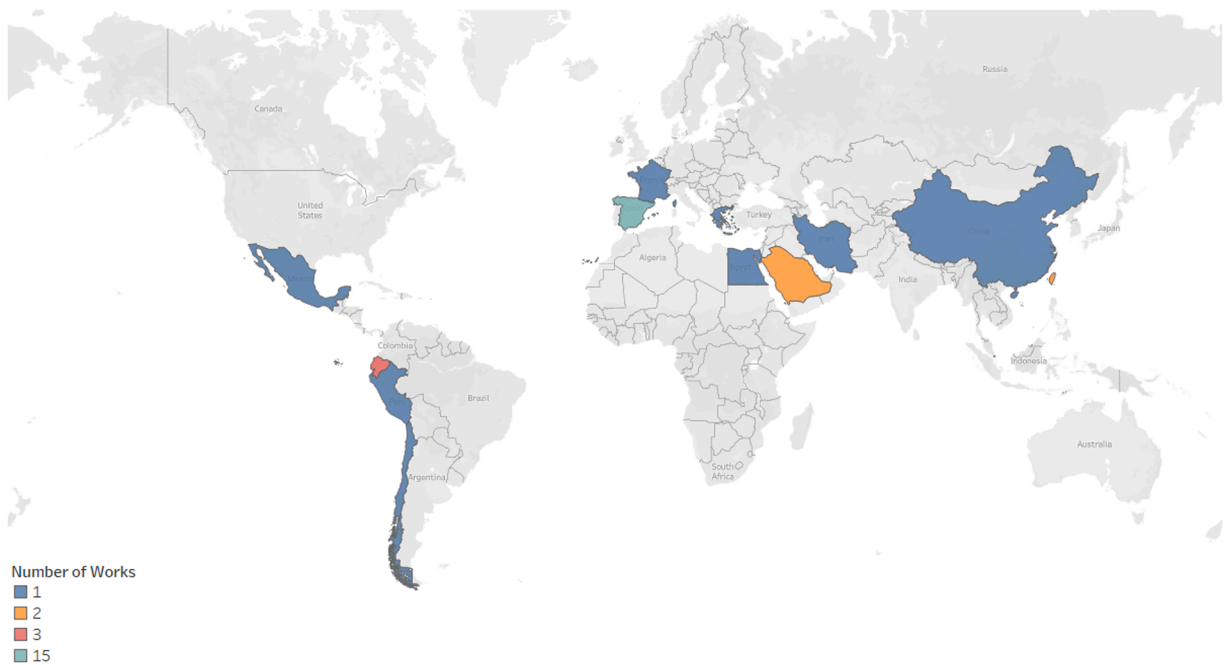
Fig. 3. Geographical distribution of the final study sample
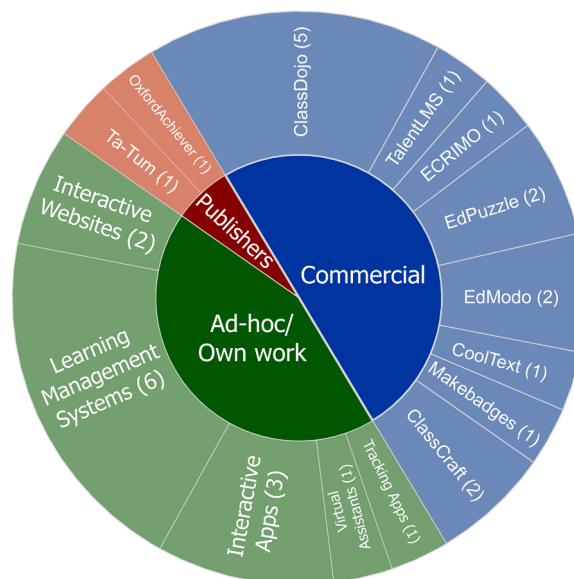Note. Authors' own work.

Fig. 4. Software used in the compiled gamification experiences
Note. Authors' own work.

67,74 % (n = 21) of the contemplated studies in this review, only behind feedback (n = 26; 83,97 %). Although every mechanic seems to have a similar cooccurrence with the rest of elements of its nature, competition presents a notably low cooccurrence with challenges (n = 8; 57,14 %) in comparison with the overall mechanics group, and higher when it comes to acquisition (n = 10; 71,43 %) comparing with the occurrence of this last mechanic with cooperation.

This characterization of the study sample translates, finally, in the overall dominance of progress over the rest game dynamics (n = 26; 83,87 %), while the implementation of constraints falls in disuse (n = 8; 25,81 %). Narrative and emotions are used with identical frequence (n = 14; 45,16 %), having a slightly higher prevalence than relationships developed during the compiled experiences (n = 13; 41;94 %).
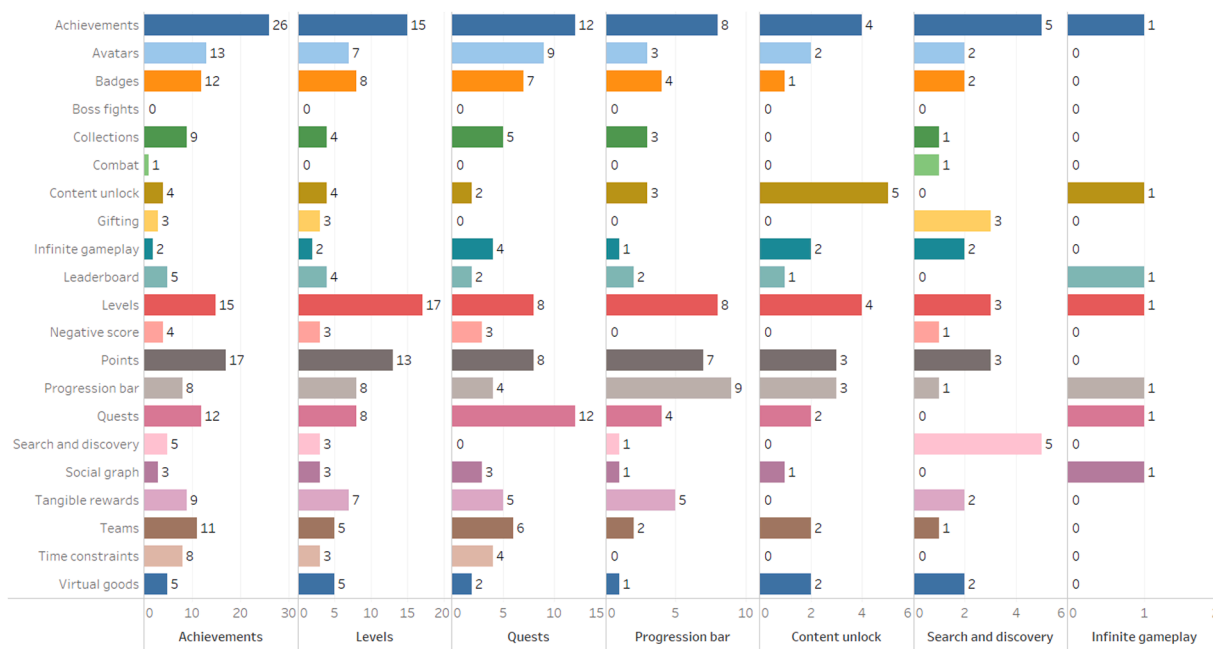
Fig. 5. Cooccurrence of progress-related components
Note. Authors' own work.
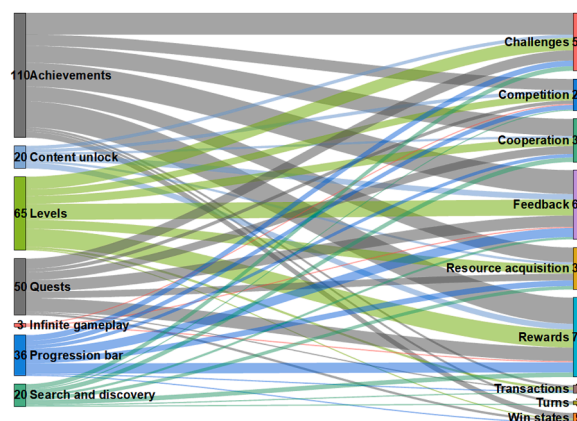
Fig. 6. CML of progress-related components
Note. Authors' own work.

3.3. In which primary education curricular areas are gamification experiences developed and what general outcomes derived from them?

In order to benefit understanding of the curricular characterization of the sample, as shown in Fig. 11, studies are thereby grouped taking as a base reference Lim et al.'s (2022) subject parcellation, as it has been one of the very few works focused on establishing differences regarding gamification practices across fields of study and training. Complementarily, certain matter divisions established in this work will be reimagined in accordance to the field framework develop by the UNESCO Institute for Statistics (2015), considering both geography and history as integrating pillars of a wider Social Science discipline field may be more adequate when addressing methodologies with a worldwide scope, while Lim et al.'s (2022) original classification did not include Physical Education as a curricular area.

Additionally, a separate field for Foreign Language teaching has been established, given that aspects linked to its acquisition greatly differ from the way in which a first language is acquired, not being proper to sum both areas in a greater Linguistics one (Ganiyevna & Utkir, 2024). Finally, in order to gather and consider a variety of works related to improvement and reinforce programs as well as actions favoring sustainability with an interdisciplinary view, while not being explicitly aimed towards a given subject or area, a last category had to be set up, gaining the denomination of *Transversal curricular aspects*, following the line of previous researchers that
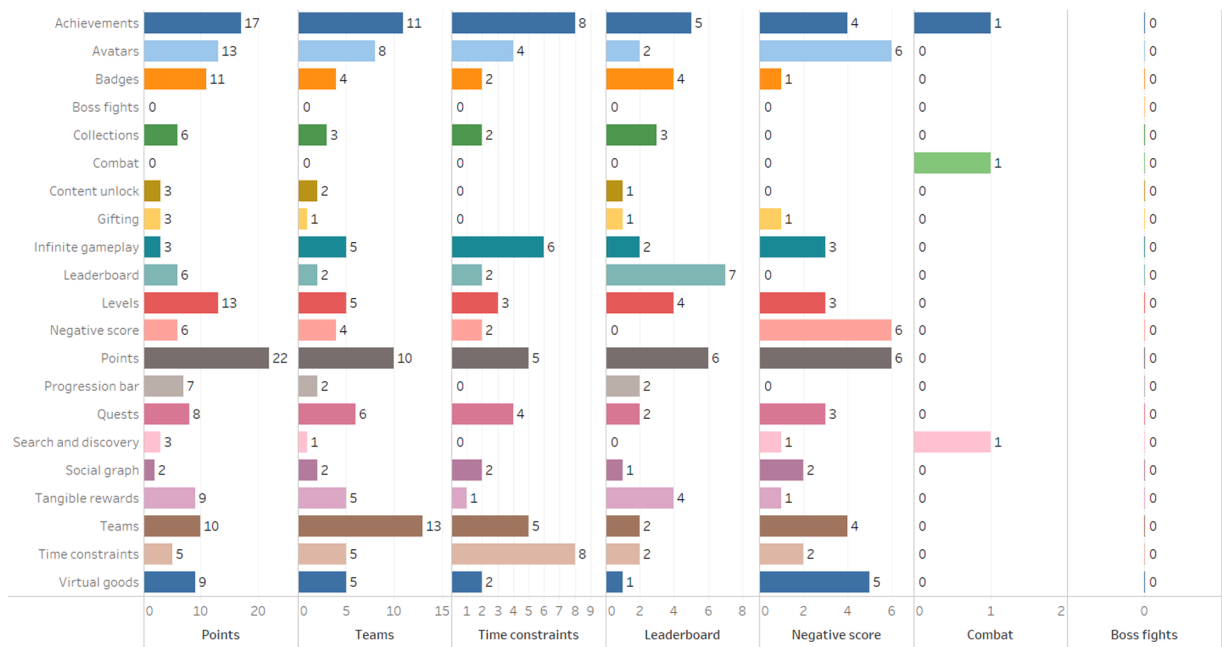
Fig. 7. Cooccurrence of scoring-related components
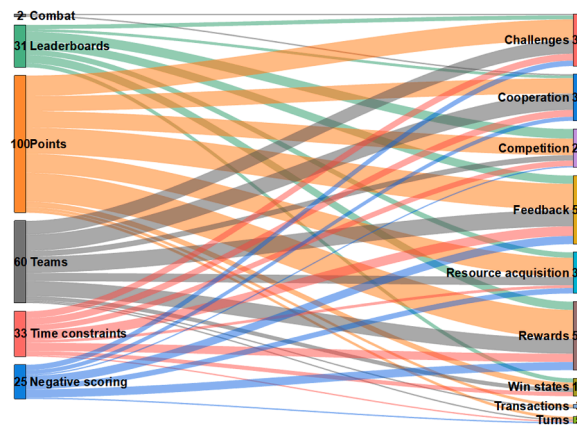Note. Authors' own work.

Fig. 8. CML of scoring-related components
Note. Authors' own work.

have addressed such notions (Colomo et al., 2022; Soler et al., 2024).

The sample offers results relative to self-regulation, academic commitment, cooperation, motivation, participation, and learning result. Of all 60 mentions in the sample to any kind of influence caused by the implementation of gamification in the final study sample, 76,67 % of them ($n = 46$) return significantly positive effects, 18,33 % ($n = 11$) point towards inconclusive results, and the last 5 % ($n = 3$) show a negative impact. Fig. 12 shows a breakdown of all these mentions regarding the nature of them according to their associated outcome.

About a quarter of the sample is formed up by experiences developed in the curricular area of Mathematics ($n = 8$), being three of them focused on the teaching and learning of programming. This curricular area, analyzing all the retrieved results ($n = 17$), obtained exclusively positive outcomes regarding commitment ($n = 4$), motivation ($n = 4$), participation ($n = 2$), and self-regulation ($n = 1$). Nevertheless, it cannot be confirmed that gamifying mathematics derives in an improvement of the students' learning results, as an identical number of references were obtained regarding the matter of both a positive and inconclusive nature ($n = 2$). Finally, only two mentions regarding the influence on cooperation were obtained, being both of them of a negative nature ($n = 2$).

Natural Sciences has hosted a total of six gamification experiences included in the final sample (19 %), while only a single intervention has taken Social Sciences as its curricular theme of interest. Regarding all the outcomes derived from these two areas ($n =$
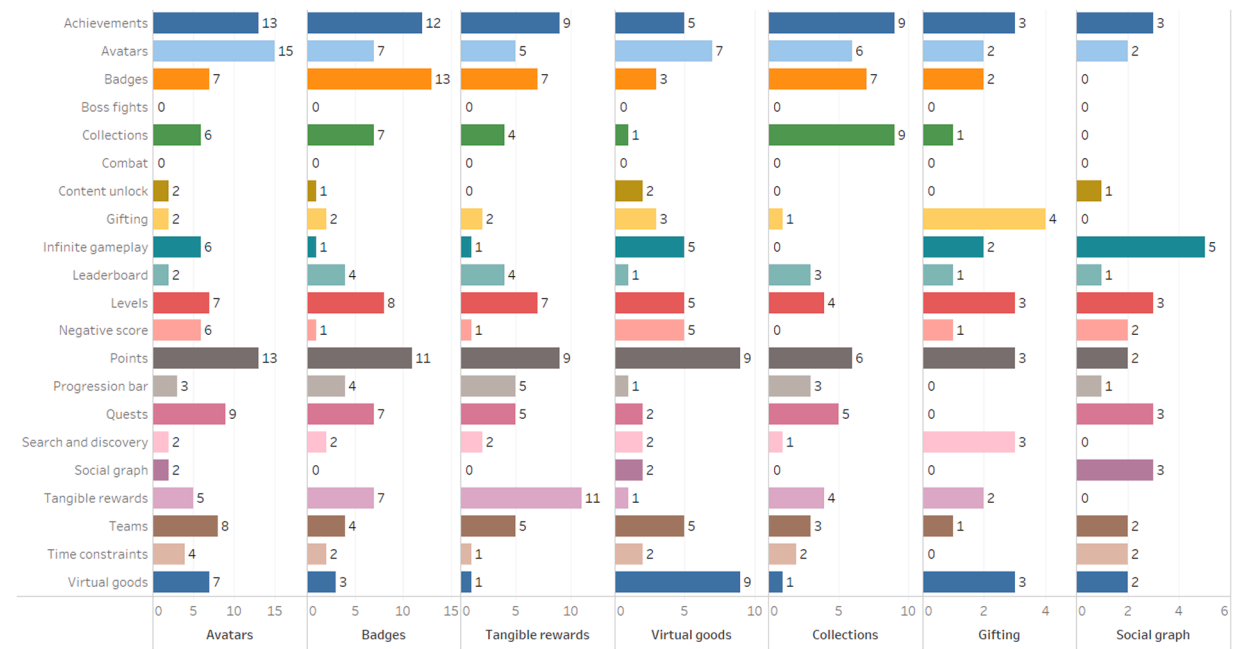
Fig. 9. Cooccurrence of rewards-identification-related components
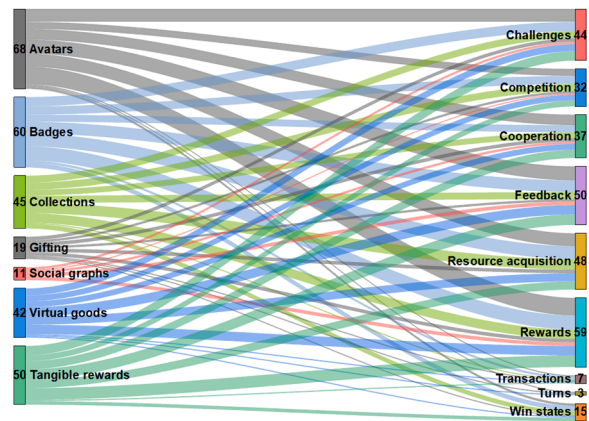Note. Authors' own work.

Fig. 10. CML of reward-identification-related components
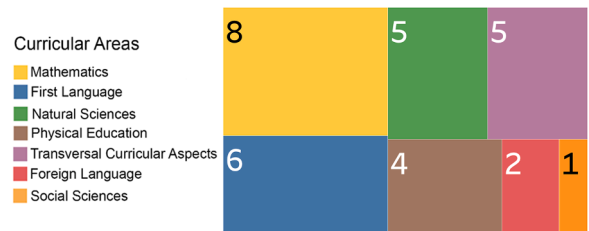Note. Authors' own work.

Fig. 11. Addressed curricular areas in gamification experiences in Primary Education
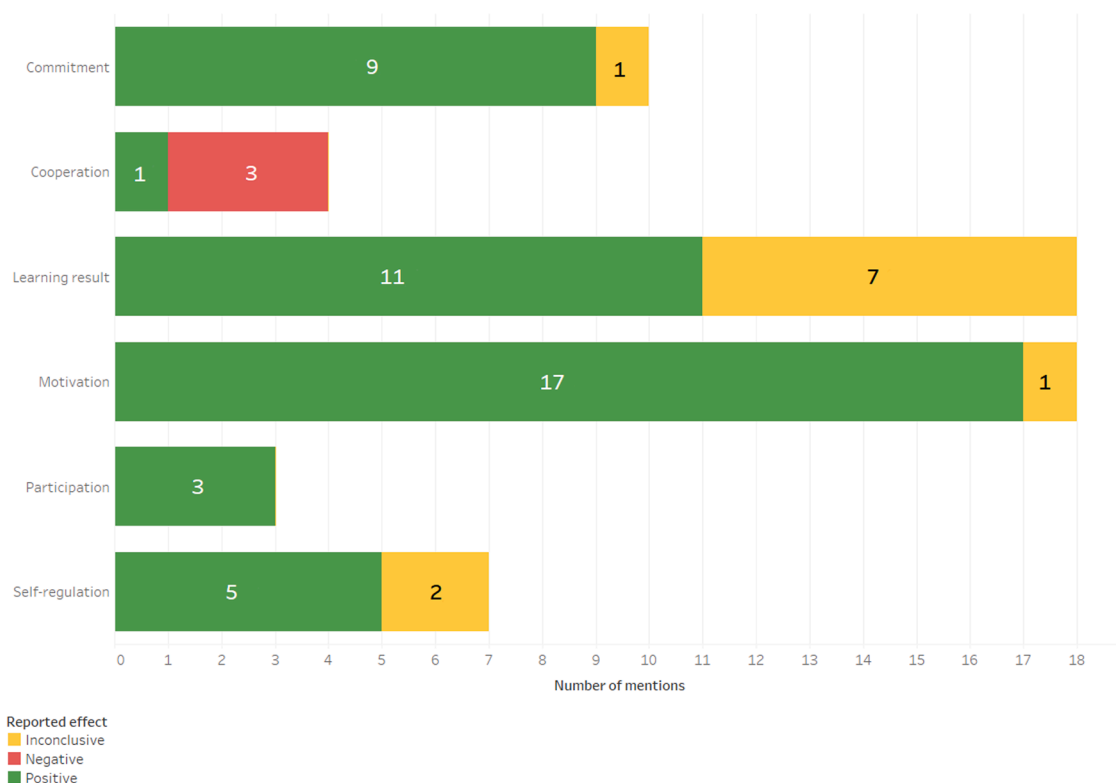Note. Authors' own work.

Fig. 12. Effects of gamification in practical experiences developed in Primary Education
Note. Authors' own work.

10), while no mention was made either to cooperation nor participation, commitment, and self-regulation obtained majorly positive results ($n = 2$, and 4, respectively) while motivation obtained a positive result and another inconclusive result. Regarding the effect on learning results, and similar to the previous area, two references were obtained, being one positive and the other inconclusive.

Linguistics, understanding it as the teaching of the learners' first language, occupies a total of six studies of the final sample (19 %). Additionally, it was indeed possible to form up a specific subarea linked to Foreign Language, formed up by two experiences (7 %), both taking English as its vehicular language. Studying all the outcomes derived from these curricular areas ($n = 14$), no negative outcomes were observed, however, the five positive results retrieved in matter of learning result were contrasted with two inconclusive results, while self-regulation retrieved two positive results as well as an inconclusive one. Commitment, cooperation, and participation, on the other hand, only returned positive results ($n = 2$, 1, and 1, respectively).

Physical Education represents 13 % of the compiled articles, having developed four experiences. Of all the ten mentions of influence of gamification over the learners in the compiled experiences, motivation received six positive mentions while self-regulation retrieved one positive result. Cooperation only derived in one negative outcome, while learning result, similarly to previously studied areas, obtains both one positive outcome and an inconclusive one.

Finally, within the diverse field of *Transversal curricular aspects* ($n = 5$; 16 %), although lacking thematic homogeneity, of all the nine retrieved outcomes, self-regulation and motivation only retrieved positive results ($n = 1$, and 3, respectively). Commitment obtained a positive result and an inconclusive result, while learning result retrieved two positive outcomes and an inconclusive one.

4. Discusion

Once the works integrated in the final study sample have been carefully analyzed, an overall rising tendency in the publishing volume of gamification experiences in Primary Education both in WOS and Scopus over the last five years, getting to a maximum of eight annual indexed works during 2023, and a minimum of four studies in 2022. Similarly, the existence of an international interest in the topic has been proven, addressing almost every Primary Education curricular area. Finally, it has been observed that a combination of game elements linked to progress, rewards, and scoring has derived in majorly positive effects over the target population.

This rising tendency regarding study indexation is in line with a previous review, centered around Higher Education, developed by Alonso-García et al. (2021), as well as with Vrcelj et al.'s. (2023) conclusions. It is possible that the exception to this publishing line observed in the year 2022 may be due to the effects of the COVID-19 pandemic, since moving to a full-time online teaching-learning environment greatly facilitates the introduction of technological tools and resources based on gamification (Krath et al., 2021). This could have led to a higher publication volume between the years 2020 and 2021, which would later decrease after a complex return to

educational normality of face-to-face classrooms interactions and lessons (Alahmani et al., 2023), until the enhancement catalyzed by the overall stabilization of the social and sanitary global situation, along with the new knowledge and experiences fostered by such uncertain and critical times.

The geographic distribution of the sample seems to be in line with previous systematic literature reviews, as the one conducted by Lampropoulos and Kinshuk (2024) include Greece, but not France, in the European context of the compiled experiences, as well as Peru in the American and Saudi Arabia in the Asiatic contexts; being all of this complemented by the inclusion of Taiwan, Hong Kong, Singapore and Mexico in the work published by Ekici (2021). Both studies coincide in placing Spain as the country that has hosted the most empirical studies involving gamification in the stage, which has been proven and reinforced in the present review.

The vastly multidisciplinary sample configured in this systematic literature review can be explained in line with the theses presented by Lim et al. (2022), who affirm that every curricular area is subject to potential gamification as long as it is conducted under a meticulous, reasoned, and formal methodological design. This phenomenon finds its explanation in the work published by Parra-González et al. (2021), where it is stated than Primary Education learners are the student population who show the most receptive and proactive attitude towards the implementation of gamification designs.

This, therefore, leads to this kind of methodological intervention being relatively common, varied and spread throughout the subjects linked to this educational stage. It is worth noting, however, that no experiences associated with Art Education, nor one of its subdivisions such as Music Education or Plastic and Visual Arts Education, are part of the final study sample.

Just as the analysis conducted by Buckley et al. (2019) shows, boss fights have no representation whatsoever in the game elements present in the study sample, while less than 80 % of the addressed studies include achievements in their planning. Although points did not reach the expected prevalence percentage, their use rate finds itself to be relatively close to it (70,97 %). Despite that, the characterization of the sample contradicts the lack of use of tangible rewards reported in the aforementioned work, participating in 35.48 % of the compiled and analyzed articles.

The distributed presence of progress-related components is in line with the findings provided by Costa (2023), given that learners enjoy the achievement feeling catalyzed by their learning progress. Now, this can be due to the wide diversity that exists between groups, having to design a proposal according to the target users (Fernández et al., 2023). Additionally, the subgroups created in the rewards-identification game component category appears to be linked to the technological tools and resources that have been implemented in numerous of the analyzed methodological interventions, highlighting the virtual goods-avatars connection that can be traced back to ClassDojo's gamified operating structure (Alsadoon et al., 2022).

Moving on the use analysis of the so-called PBL triad, it can be affirmed that both points and badges show a regular participation in numerous of the works contained in the final study sample, proving the conclusions reported by Li et al. (2024) by establishing external motivators that derive in intrinsic motivation as key elements of the gamified design. Nevertheless, the use of leaderboards is considerably distanced from these other two components, which contradicts the description and contextualization by of them as one of the most common and relevant game elements in gamified designs by Werbach and Hunter (2020).

Analyzing these elements from a geographical perspective, considering how impactful and determinant the game culture of each different country may be when designing game-inspired experiences, it has been shown that most gamified approaches rely on fast-paced competitive elements such as points, leaderboards, time constraints and teamwork. Considering that most reviewed experiences took place in European countries, a potential correlation between actual gaming tendencies and classroom-level game-inspired designs may exist in the current-day gamification global sphere, given the liken towards strategy in the continent (Bar & Otterbring, 2021), ultimately validating Sotamaa's (2021) extrapolation to game design culture if one describes education as game designers in their own right. Another explanation could be found in how teachers tend to abusively rely on external software to *gamify* their lessons (Fiuza-Fernández et al., 2022), tending to implement straightforward elements such as the aforementioned ones.

Nevertheless, even if it would seem that European gamification patterns align in a much more direct way with the Finnish mobile gaming industry than with the lore-based immersive Polish model (Özalp, 2024), being this reinforced by the severe lack of implementation of exploration-related and extended gameplay elements, almost no social or interactive aspects out of avatars tend to be use, such as social graphs or gifting between users, being such capabilities one of the most prominent characteristics of mobile gaming (Wallach, 2020). In any case, the dominant tendency in the current gaming industry is equally compromised in its extrapolation to the gamification field, as it deeply relies on open-world extended adventures (Qaffas, 2020; Tongue, 2021), ultimately aligning with the main design line appreciated by Cole et al. (2024) in their state of the art of gamification in the Secondary Education educational stage, as well as Clement's (2024) take on game popularity, positioning shooters as the most relevant genre nowadays.

Such a wide departure from the standardized globally accepted gaming products can be further delimited in how, as previously established, competitive, and ephemeral are the most extensively used while players tend to prefer lore-based single player or cooperative missions over short-stuffed adventures (Google for Games, 2023). As a result, among the few most popular game genres of recent years, gamification practices in Primary Education appear to be inspired by shooters and arcades the most, given their reactive and competitive nature (Sundararajan, 2022; TIGA, 2016), while single player immersive and complex environments, a model followed by some of the best-selling recent games including *The Legend of Zelda: Tears of the Kingdom, Hogwarts Legacy* or the *Resident Evil* series (AEVI, 2024), are habitually represented only in the form of badges and tangible rewards/virtual goods linked to game progression, being this in direct opposition to Camuñas-García et al.'s (2024) study on videogames of potential educational use, in which about 90 % of the analyzed products had a "narrative-driven gameplay" (p. 9). A potential explanation behind this parallel educational design line could be allocated with regard to the lack of research in the educational use of videogame-inspired practices when it comes to younger pupils, as versed by Guan et al. (2024).

Additionally, the heavy presence of progress-related game elements associated with the notion of vertical ascension within the game, or gamified for that matter, environment could potentially be traced back to the arcade and *gacha* developmental line

appreciated by Özalp (2024) in the Asian industry, which builds up the second gamification block of the included studies. Finally, it is worth noting as well that such fast-paced and reaction-based gaming experiences frequently include luck-related functions, nevertheless, no game element related to randomness has been located within any of the reviewed articles, despite the fact that such aspect is characteristic of American playful approaches (Bar & Otterbring, 2021), a continent that builds up the third most extended publication corpus of the present study.

It is worth mentioning that the design tendencies regarding mechanics appears to be quite similar to the ones described by Noorozi et al. (2020) in GBL publications, as feedback and challenges are reported to be the dominant ones in gamified Primary Education sessions as well. Nevertheless, and contrary to the aforementioned authors' findings, collaboration fell short regarding frequency of implementation in gamification proposals, which may hint at an innate rather competitive nature in contrast to GBL within the Primary Education stage, in which peer identification through competition plays a key role regarding pupil development (Priego-Ojeda et al., 2024).

The results derived from the addressed experiences contradict the instability described by Sailer and Homner (2020) in regard to an increase in motivation catalyzed by gamification, as the analyzed study sample showed a wide proportion of reported positive effects regarding the matter, further supporting Moon et al.'s (2024) claims as a result. This is especially notable in Physical Education, in which motivation has only positive reported effects and positions itself as the most commonly achieved outcome in the area. In this same line, the benefit regarding learning results and academic achievement established by Bachini et al. (2023) and Rosati et al. (2024), although not possible to completely deny, has been compromised given the retrieval of enough inconclusive results in order to be considered questionable, being this a common tendency in all curricular areas.

Finally, as Trujillo-Torres et al. (2021) show, there are inconclusive results regarding the effects of gamification over convivence and classroom climate, which has been particularly detected in areas where either competition or errors play a critical role in the development of classroom climate, such as Mathematics and Physical Education, potentially thwarting Zheng et al.'s (2024) claims regarding this approach as successful in training and development of fruitful and civic future generations. These, however, can be associated to inadequate methodological design, as proposed by Queiros and Pinto (2022), given that there are records of experiences that were able to cause behavioral changes towards positive and prosocial attitudes (Yassine & Tipton-Fisler, 2022).

5. Conclusions

Gamification continues to be a relatively unexplored asset, lacking contextual and specific information of value regarding the Primary Education stage. Although more practical experiences have been developed during the last few years that may be of guide and reference to future iterations of this methodology, there is still an important theoretical void regarding the fundaments and arguments for using the various aspects that conform the gamified design.

Having given answer to the initially posted Research Questions, and consequent main objective, it can be affirmed that further field work needs to be undergone regarding training and initiation in gamified design bases, as a good amount of works that were to be potentially included in the present review had to eventually be discarded due to not meeting one or several assumptions of the gamification design framework. This fact not only points at a lack of consensus on the term *per se*, but to a lack of proper training amongst prospect and in-service educators in relation to the needs of such a complex methodological structure, leading to inadequate application, potentially causing discrepancies between the real effects behind its use and the existing theoretical corpus.

Under a more practical view, the results compiled within this systematic review prove that gamification, although retrieving mixed results regarding learning result, even negative when it comes to classroom climate, its potential to include various technological and analogical resources of interest habilitates educators to further reinforce pupil engagement, motivation, self-efficacy and classroom participation, being an impactful reason to incite its use and potential settlement as a recurrent methodological approach in the Primary Education stage.

Among the main limitations of this study, it is worth mentioning the absence of a true academic consent on what educational gamification really entails and implies, which has led to the production of experiences and interventions that, even if close to the idea and of great educational interest, cannot be categorized as true representations of gamification as they fail to follow key defining aspects of its conceptualization.

Similarly, the lack of true representation of specific game elements that were to be studied has greatly difficulted the establishment of findings about their usage and effect. Complementarily, incompatibilities between different educational systems in matters of age limits regarding Primary Education have derived in the discarding of experiences in which the study sample involved one or multiple of the aforementioned critical limit ages.

Further researching the subjacent relationships and interconnections established between different game elements implemented in the design of gamified experiences is an essential step towards the crafting of a theoretical framework of reference and use. In this way, and beyond clearing up confusions and doubts related to the true bases of gamification, a useful and well-established guide, of which the findings reported in this work act as a starting point in the Primary Education context, can be defined in the collaboration between educational professionals of a vast diversity of institutions and educational contexts all around the world, given the explicit global interest in the usage and active implementation of this methodology.

As games and interactivity reveal themselves as essential aspects of human growth and development worldwide, designing playful teaching and learning environments progressively becomes an implicit demand coming from students worldwide that wish to have fun while accumulating knowledge, establishing their personality and behaviors and mastering new skills in a society where gaming can be defined as one of the most important languages of online and international interaction.

Ethical statement

The authors of the present work declare that no fraudulent authorship practice was carried out in the development of this study, including the hiding or untruthful information regarding research background, methodology and reported results. No AI software was used in the development of this work.

Data availability

The data on which the present work has been based can be recovered either by accessing the references provided by the authors in this paper or by replicating the previously detailed research methodology and process. Studies that have been part of this systematic literature review are of public access through the WOS and Scopus databases. Studies that configure the final study sample of this work are either open access or can be obtained by asking their respective authors. The results derived from their analysis have been included, detailed and specified in the work at hand. Regarding the registers that were initially retrieved yet discarded during the research process, the authors still have possession of the register archive that was built during the establishing of the final study sample, including the bibliographical information of every included and discarded study.

Academic commitment

Describes the external crystallization of motivation towards learning or any given curricular area, often manifested through time spent in acquiring and mastering the target skills, attitudes and knowledge, overall interest and desire for interaction in an academic setting, and capability to overcome obstacles in the process of optimal performance.

Components

The basic form of game elements. They constitute the most visible and specific concretions of the game design structure, including aspects such as points, leaderboards or levels.

Dynamics

The game elements of the highest order. They can be described as naturally occurring phenomena that derives from the interaction between the student-player and the mechanics, and by extension components, implemented in a proposal. They include relationships, constraints, emotions and narrative.

Game elements

Refers to aspects taken or inspired from game design that are to be applied in an intervention or activity in order to make instruction more appealing to students. Most of them are already part of exposition-reception methodologies in the educational world, however, their status as game elements relies on their explicit implementation under a playful purpose.

Game-based learning

Commonly known as GBL. Involves the use of games, including digital games or videogames, in educational settings with the goal of fostering and improving the overall learning process.

Gamification

The use of game elements in non-game contexts. When used in regard to educational settings, it refers to the implementation of game elements in the methodological structure of an intervention or lesson.

Learning achievement

The state of having mastered an educational content, knowledge or skill of reference, often linked to the contrast between the learners perceived self-efficacy and the overall progress that has been developed in a subject, activity or intervention.

Learning result

An umbrella term including academic achievement and any sign of change in the physical-cognitive developmental state of the student derived from an educational intervention, activity or effort.

Mechanics

Elements, built upon game components, that control and determine the overall progress, directionality or nature of a gamified intervention. Some of the most frequent mechanics are cooperation, competition, feedback and rewards.

Methodology

In an educational context, it involves the set of characteristics, actions, aspects and goals that configure the way in which an educator addresses a lesson or any given activity of an educational nature. Although there is a plethora of alternatives regarding methodological alternatives, they all need to be systematically applied for an extended period of time to be deemed as such.

Self-regulation

The capacity of a learner to determine their specific way of studying, working and/or reviewing educational aspects, as well as the capability of controlling one's own thoughts, actions and attitudes towards a given subject.

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José-María Romero-Rodríguez: Writing – review & editing, Supervision, Methodology, Funding acquisition, Conceptualization. **Alejandro Martínez-Menéndez:** Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Santiago Alonso-García:** Writing – review & editing, Writing – original draft, Supervision, Funding acquisition, Conceptualization. **Juan-José Victoria-Maldonado:** Conceptualization, Funding acquisition, Methodology, Supervision, Writing – review & editing.

Declaration of competing interest

The research does not require explicit authorization to be carried out, since the present study is a systematic review in two scientific databases. Eligibility bias has been eliminated, as indicated in the PRISMA guidelines, through the collaboration of the different authors, and the funding of the research does not involve any conflict of interest with respect to the research. On the other hand, it is important to mention that AI has not been used for the article, since the only software used for the research has been the Zotero tool with the intention of facilitating document management and the filtering of duplicate articles.

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