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Original Article

Gamification and Play Elements for Children: A Bibliometric and Content Analysis (2020-2025)

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Abstract

Gamification and playful design are increasingly used to support learning, behavior, and health in children, yet the literature is scattered across psychology, education, computer science, and medicine. This study combines a bibliometric analysis with a content analysis to map how the field developed between 2020 and 2025 and what it reports. Records were retrieved with a three-concept search strategy covering gamification, play elements, and children, and were narrowed from 17,756 initial records to 4,329 open access journal articles with abstracts. Output grew from about 405 records in 2020 to about 1,480 in 2025. The author base is fragmented, with no author exceeding six documents, and Indonesian and Brazilian institutions are prominent alongside contributors from Malaysia, the United Kingdom, Hong Kong, and the United States. The keyword network resolves into three clusters centered on school-based experimental research, emotion and mental health in schools, and the implementation of social and emotional learning. A content analysis of 18 recent publications shows that points, badges, levels, and leaderboards are the most common mechanics, whereas narrative, avatars, social play, and scaffolded feedback are more closely tied to immersion, emotional connection, and reduced anxiety. Reported outcomes include improved engagement, motivation, physical activity, oral health routines, and emotional skills. The main gaps concern developmental calibration, overreliance on extrinsic rewards, cognitive overload, and the shortage of non-digital materials for low-resource settings.

Keywords: Children, Early Childhood Education, Gamification, Play Elements, Social and Emotional Learning.

1. Introduction

Gamification integrates game mechanics into non-gaming contexts to support learning, behavioral development, and health management in children (Gkintoni et al., 2024; Ríos et al., 2026; Semartiana et al., 2022). When these mechanics are calibrated to a child's developmental stage, playful elements reliably enhance engagement and motivation across educational and health domains (Lathifah et al., 2025; Lorenzo-Lledó et al., 2023). Mobile applications, tablet games, augmented reality tools, and even screen-free activities now borrow the structure of games to make routines such as studying, exercising, and brushing teeth feel purposeful and enjoyable (Chen et al., 2025; M. Huang & Wang, 2025).

The field has also moved beyond points, badges, and leaderboards. Immersive features such as storytelling, avatars, and role-playing are now recognized as strong drivers of sustained engagement (Kubota et al., 2024), and recent qualitative work suggests that children value agency, peer interaction, and a low-stress climate more than rigid game mechanics alone (Kokarida et al., 2026). This shift makes the distinction between gamification, which adds game design elements to a task, and play elements, which invite exploration, imagination, and

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role-taking, increasingly important for both research and design. The evidence is not uniformly positive, however. A recent meta-analysis noted that the effectiveness of gamification has been inconsistent and depends on whether game elements fit the developmental characteristics of children (Lathifah et al., 2025). Systematic reviews further warn that an overemphasis on extrinsic rewards can undermine intrinsic motivation (Wang et al., 2025; Zourmpakis, 2026) and that game elements exceeding a young child's processing capacity can lead to minimal or counterproductive outcomes (Lathifah et al., 2025; Zourmpakis, 2026).

Research on the topic has expanded across several disciplines, and most existing syntheses concentrate on a single domain. Reviews and studies have examined early childhood and primary education (Lorenzo-Lledó et al., 2023; Zourmpakis, 2026), oral health (Chen et al., 2025), physical activity (Wang et al., 2024), psychosocial well-being (Kubota et al., 2024), disaster preparedness (Ningrum et al., 2026), and learners with special needs (Shaltout et al., 2021; Silva et al., 2024). Ríos et al. (2026) mapped research trends in gamification and playful elements for children through bibliometric and content analyses, the present study extends this work by integrating the distribution of publications over time, contributions from authors and other research actors, thematic patterns, and the substantive findings reported in the included studies. This integrated perspective allows the analysis to move beyond identifying where research is concentrated toward examining what the literature reveals about the field. The resulting synthesis can help researchers identify priorities for future investigation and support practitioners in making more evidence-informed decisions about which gamification and playful approaches to adopt.

This study therefore combines a bibliometric analysis with a content analysis of gamification and play elements for children published between 2020 and 2025. The bibliometric component asks how publication output changed over time, which authors, sources, institutions, and countries contribute most, which themes and keyword clusters dominate the literature, and which themes appear to be emerging. The content analysis asks which gamification and play elements are used most often, in which contexts, age groups, and purposes they are applied, and what outcomes and research gaps are reported. By linking the structure of the literature to the substance of its findings, the study aims to offer a clearer basis for future research and for the design of developmentally appropriate playful interventions.

2. Literature Review

Gamification refers to the use of game design elements in non-game contexts (Deterding et al., 2011), whereas play encompasses broader play experiences, ranging from free activity to guided play (Zosh et al., 2018). Both need to be distinguished from game-based learning, which uses games as a learning medium. This distinction provides the conceptual basis for examining the literature on gamification and play elements for children without treating the two as identical approaches.

Theoretically, Self-Determination Theory explains the roles of autonomy, competence, and social relatedness in motivation (Ryan & Deci, 2000). This perspective is relevant for understanding the use of rewards in gamification, whose impact on intrinsic motivation depends on the form and context of implementation (Deci et al., 1999). Flow theory (Csikszentmihalyi, 1990) and the concept of scaffolding (Wood et al., 1976) complement this framework by explaining engagement in challenging activities and gradual support matched to the child's abilities. These four perspectives are used as an interpretive lens for the themes emerging from the mapping, not as categories determined before the analysis.

Previous studies have addressed gamification through meta-analyses of learning effectiveness (Sailer & Homner, 2020), systematic reviews in health contexts (Johnson et al., 2016), and bibliometric mapping in education (Swacha, 2021). Behl et al. (2022) specifically mapped research on gamification and e-learning for young learners. In the past five years, syntheses of empirical evidence on gamification have grown rapidly and generally report conditional positive effects. Meta-analyses by Bai et al. (2020), R. Huang et al. (2020), and Yıldırım and Şen (2021) show positive effects of gamification on learning outcomes, with effect sizes influenced by intervention duration, learning context, and the design of game elements. Similar findings appear in systematic reviews of education in general (Manzano-León et al., 2021; Zainuddin et al., 2020) as well as in specific fields, such as science education (Kalogiannakis et al., 2021) and second language learning (Dehghanzadeh et al., 2021). Quasi-experimental classroom evidence, for example the use of gamified quizzes, also shows improved learning achievement when game elements are integrated with learning objectives (Sanchez et al., 2020). In addition, a review of online learning during the pandemic highlights the potential of gamification in sustaining learner engagement (Nieto-Escamez & Roldán-Tapia, 2021). On the play side, the meta-analysis by Skene et al. (2022) found that guided play supports children's early learning outcomes better than direct instruction, in line with the idea of scaffolding. These findings indicate that the impact of gamification and play depends on design, context, and learner characteristics, so the themes emerging from the mapping in this study are read with these factors in mind.

3. Methods

3.1. Research Design and Procedure

The study used a two-part design combining bibliometric and qualitative content analysis. The bibliometric component followed Donthu et al. (2021) four-step guideline: defining aims and scope, choosing analytical techniques, collecting data, and running the analysis and reporting findings. Performance analysis (counts and citations by year, author, institution, country, and source) was combined with science mapping (field classification and keyword co-occurrence), following Zupic and Čater (2015). Record selection was documented using PRISMA principles (Page et al., 2021). The content analysis followed Elo and Kyngäs (2008). preparation, organizing, and reporting phases. Table 1 links each research question to its analytic approach.

Table 1. Research questions and analytic approach

RQ	Question	Analysis
RQ1	How did publication output develop between 2020 and 2025?	Annual counts and growth (Figure 1)
RQ2	Which authors, sources, institutions, and countries contribute most?	Counts and citations (Figures 2 to 6)
RQ3	Which themes and keyword clusters dominate, and how are they structured?	Fields and keyword network (Figures 7 and 8)
RQ4	Which themes can be considered emerging?	Peripheral clusters and recent studies (Table 4)
RQ5	Which gamification and play elements are used most often?	Content analysis (Tables 5 and 6)
RQ6	In what contexts, ages, and purposes is gamification applied?	Content analysis (Section 4.3)
RQ7	What outcomes are reported, and what gaps remain?	Content analysis (Section 4.4)

Source: Compiled by the author, 2026

Table 1 shows the seven research questions analyzed through the bibliometric and content analysis approaches. The analysis focuses on publication development, author and institutional contributions, the structure and emergence of themes, the use of gamification and play elements, application contexts, and research outcomes and gaps during 2020 to 2025. Combining the two approaches allows the literature's development to be mapped while also examining the substance of research on gamification and play elements for children.

3.2. Operational Definitions

Gamification refers to the use of game design elements, such as points, badges, leaderboards, and missions, in non-game contexts. Play elements refers to playful and play-based features, including exploration, role-taking, imagination, challenge, and story. Children refers to individuals from birth to 12 years of age, spanning early childhood through elementary school. Adolescents (13 to 17 years) were not targeted, although records that examine children and adolescents together were retained. Game-based learning and serious games were included only when they explicitly referred to game elements or gamification, so that the focus of the review would not be diluted.

3.3. Search Strategy

The search strategy combined three concept blocks: gamification, play elements, and children (Table 2). Terms within a block were combined with OR, and the child block was combined with the gamification and play element blocks with AND. Asterisks capture word variants, and quotation marks indicate exact phrases. Records were retrieved from Lens.org.

Table 2. Search terms by concept

Concept	Search terms
Gamification	gamif*, "game element*", "game mechanic*", "game-based", "game-like", "points badges leaderboards"
Play elements	"play element*", playful*, "play-based", "learning through play", "game design element*"
Children	child*, kid*, "early childhood", preschool*, kindergarten*, "primary school", "elementary school", "young learner*"

Source: Compiled by the author, 2026

3.4. Data Selection and Time Window

The initial search returned 17,756 records. Restricting publication years to 2020 through 2025 reduced the set to 8,482 records, restricting the document type to journal articles reduced it to 5,813, and limiting the results to open access records with an abstract yielded a final dataset of 4,329 records (Table 3). About 24% of the initial records were therefore retained.

Table 3. Record selection

Stage	Records (n)	Removed (n)
Initial search results	17,756	n/a
After year filter (2020 to 2025)	8,482	9,274
After document type filter (journal articles)	5,813	2,669
After open access and abstract filter	4,329	1,484
Final dataset	**4,329**	**n/a**

Source: Compiled by the author, 2026

Four considerations guided the choice of 2020 through 2025. First, the six-year window reflects recent developments in gamification and play elements for children. Second, it covers

the onset of the COVID-19 pandemic in 2020, which encouraged digital learning and game-based approaches for children. Third, the window ends in 2025 because it is a complete calendar year, which avoids the bias of incomplete counts for the current year. Fourth, six years is long enough to observe changes in themes before and after the pandemic. Records published before 2020 or after 2025, including articles that appeared in 2026, were excluded from the bibliometric dataset. The content analysis, in contrast, drew on a purposive set of 18 recent publications that includes a few 2026 studies. These were used only to interpret and contextualize the findings and do not enter any bibliometric count.

3.5. Analysis

Bibliometric indicators were read from the exported charts and are reported as counts. Values described as approximate were read from figure axes. Keyword relationships were examined through a co-occurrence network in which node size reflects frequency and color denotes cluster membership. For the content analysis, the 18 publications were coded for the gamification or play element examined, the context and age group, the intended purpose, the reported outcomes, and the stated limitations. Four categories of elements (progress and reward, narrative and immersion, social dynamics, and scaffolding and feedback) were derived inductively from this coding, and contexts and outcomes were then summarized in relation to those categories.

4. Results and Discussion

4.1. Research Results

4.1.1. Publication Trend

Output in the final dataset rose in every year of the study window (Figure 1). Annual counts increased from roughly 405 records in 2020 to about 465 in 2021, 520 in 2022, 655 in 2023, 815 in 2024, and 1,480 in 2025. This corresponds to a compound annual growth rate of about 30% and a 3.7-fold increase over five years. Year-over-year growth was modest between 2020 and 2022 (about 15% and 12%), stronger in 2023 and 2024 (about 26% and 24%), and sharpest in 2025 (about 82%). The last two years alone contribute about 53% of all records.

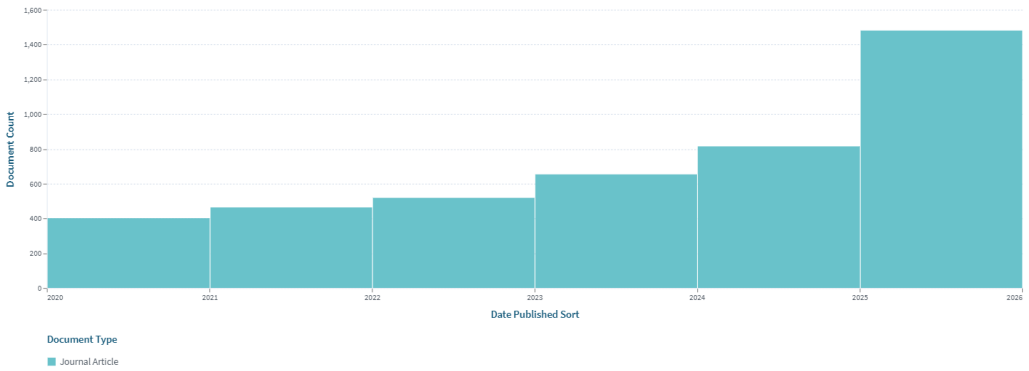

Figure 1. Number of journal articles per year, 2020 to 2025
Source: Compiled by the author, 2026

The pattern qualifies the assumption that the pandemic produced an immediate surge. Growth in 2020 and 2021 was steady rather than explosive, and the steepest acceleration came after 2022. One reading is that studies begun during pandemic-era shifts to digital and game-based learning took time to reach publication, and that interest in social and emotional

learning, child mental health, and app-based interventions kept expanding afterward. Another is that the larger 2025 count partly reflects the growth of open access publishing and repository indexing, given that the dataset was restricted to open access records. Because 2025 is also the last complete year, the sharp rise is better read as evidence of rapid expansion than as a stable growth rate.

4.1.2. Contributing Authors, Institutions, Countries, and Sources

The author distribution is highly dispersed (Figure 2). Four authors, Corina Wustmann Seiler, Isabelle Duss, Patricia Lannen, and Ryan MacLean, lead with six documents each, followed by Andrew Burrell and Kathy Hirsh-Pasek with five. Five authors have four documents, and nine more have three. Among the authors displayed, no one exceeds six documents in a dataset of 4,329 records, which indicates that the field lacks a dominant core group and that output is spread across many small teams.

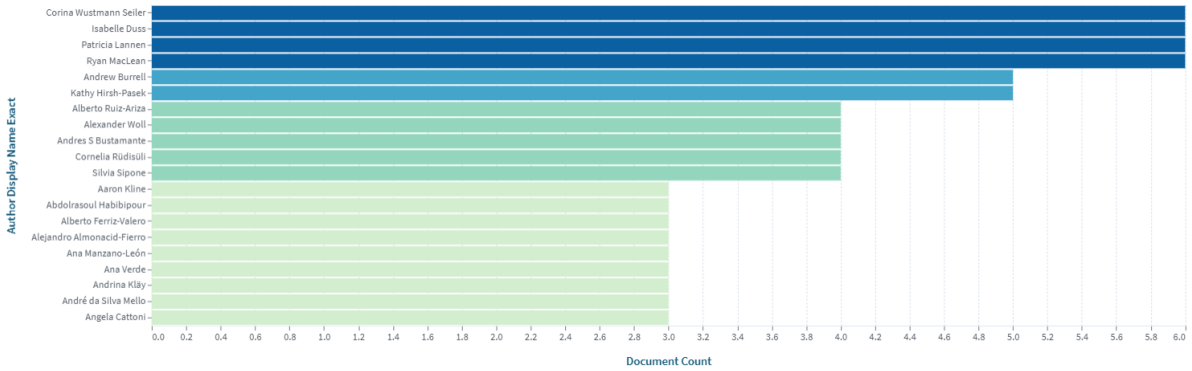

Figure 2. Most active authors by document count
Source: Compiled by the author, 2026

State University of Malang leads with 30 documents, followed by Indonesia University of Education (24), National University of Malaysia (22), and University College London (20). Three institutions have 17 documents (State University of Jakarta, State University of Semarang, and University of São Paulo), and three have 16 (Ação Educativa, University of Hong Kong, and Yogyakarta State University). The ten leading institutions together account for 195 documents, about 4.5% of the dataset, which again points to dispersion. Five of the ten are Indonesian universities, and together they account for 104 of the 195 documents (Figure 3).

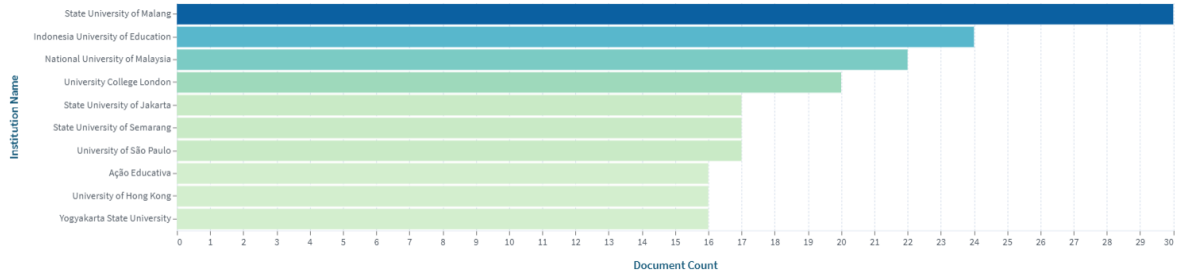

Figure 3. Top institutions by document count
Source: Compiled by the author, 2026

The country map shows the darkest shading for Indonesia, with the United States and Brazil next, followed by a broad band of moderate contributions from Western Europe, China,

India, Australia, and several other countries (Figure 4). Large parts of Africa appear lightly shaded. The map ranks countries by shading rather than by exact counts, so the ordering should be treated as indicative. It is consistent with the institutional data, in which Indonesian and Brazilian organizations are prominent, and with the source list, which includes several Brazilian and Latin American journals. Open access publishing is common in both regions, and the open access filter used here may amplify their visibility.

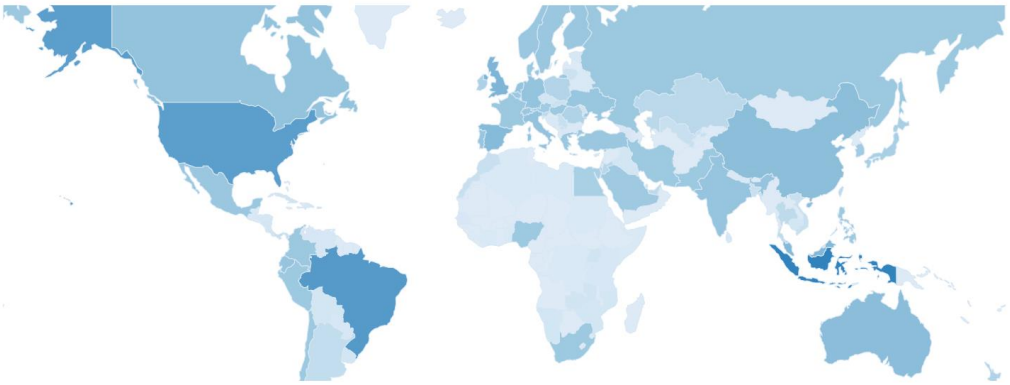

Figure 4. Most active countries and regions (darker shading indicates more documents)
Source: Compiled by the author, 2026

Zenodo, a general-purpose research repository, is the largest single source with about 128 records, roughly 3% of the dataset, which shows that deposited items such as reports and conference outputs are part of the corpus (Figure 5). Among journals and proceedings, Frontiers in Psychology (about 37), the European Conference on Games Based Learning (about 36), Education Sciences (about 31), Research, Society and Development (about 30), and M/C Journal (about 28) lead. They are followed by Children, Frontiers in Education, Retos, and a group of outlets with about 15 records each that includes the Brazilian Journal of Development, JMIR Serious Games, PLOS ONE, and Sustainability. The list mixes psychology, education, games, health, and sustainability outlets, which confirms the interdisciplinary character of the field. Five of the 18 publications in the content sample appeared in outlets on this list (Retos, JMIR Serious Games, Behavioral Sciences, PLOS ONE, and Education Sciences).

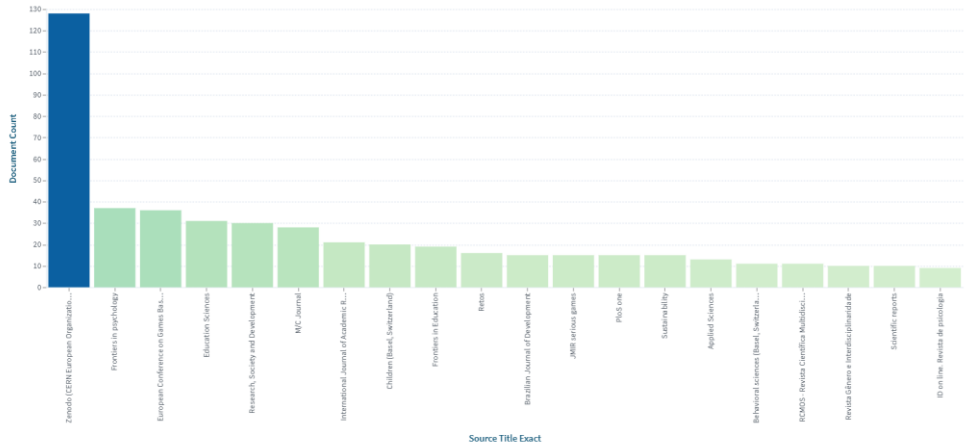

Figure 5. Top sources by document count
Source: Compiled by the author, 2026

4.1.3. Citation Impact

Among the top cited works shown in Figure 6, most have between about 5 and 40 citing works, while about ten exceed 100. The most cited record, with about 170 citing works, was published around early 2024. Highly cited items appear in every year of the window, but 2025 records naturally show lower counts because they have had less time to accumulate citations.

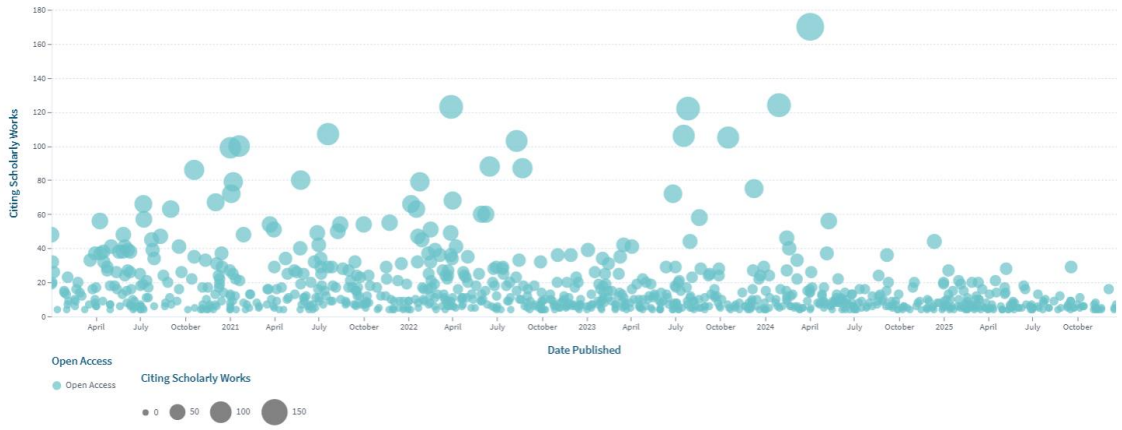

Figure 6. Top cited works by publication date (bubble size indicates citing works)
Source: Compiled by the author, 2026

4.1.4. Thematic Structure

Psychology is the most frequent field label (3,114), followed by computer science (1,828), mathematics education (1,580), pedagogy (1,255), sociology (922), and medicine (900). Developmental psychology (684), social psychology (531), multimedia (523), medical education (451), artificial intelligence (362), and human-computer interaction (312) also appear (Figure 7). Because a record can carry several labels, the counts exceed the size of the dataset. Psychology, for example, is attached to roughly 72% of records. The distribution shows three intersecting streams: a learning and development stream (psychology, developmental psychology, pedagogy, mathematics education), a technology stream (computer science, multimedia, artificial intelligence, human-computer interaction), and a health stream (medicine, medical education, nursing, psychiatry). Some labels, such as philosophy, political science, and paleontology, are unlikely to reflect the substance of the field and probably arise from automated classification and broad search terms, so the map is best treated as a coarse guide.

Figure 7. Top fields of study (label counts; records may carry multiple labels).
Source: Compiled by the author, 2026

The co-occurrence network resolves into three clusters (Figure 8). Cluster 1 (red) is the largest and is built around child, human, curriculum, controlled study, randomized controlled trial, teacher, preschool, and elementary school, with peripheral nodes for physical activity, prevention, resilience, mindfulness, and social-emotional learning. It represents school-based intervention research that uses experimental designs. Cluster 2 (green) is organized around school, schools, students, emotion, psychology, and mental health, with nodes such as social competence, academic achievement, adolescent, school health services, and qualitative research. It captures the emotional and mental health side of school contexts. Cluster 3 (blue) is small and sits at the periphery, linking social and emotional learning with well-being, education, intervention, and implementation. It reflects work on how social and emotional programs are put into practice.

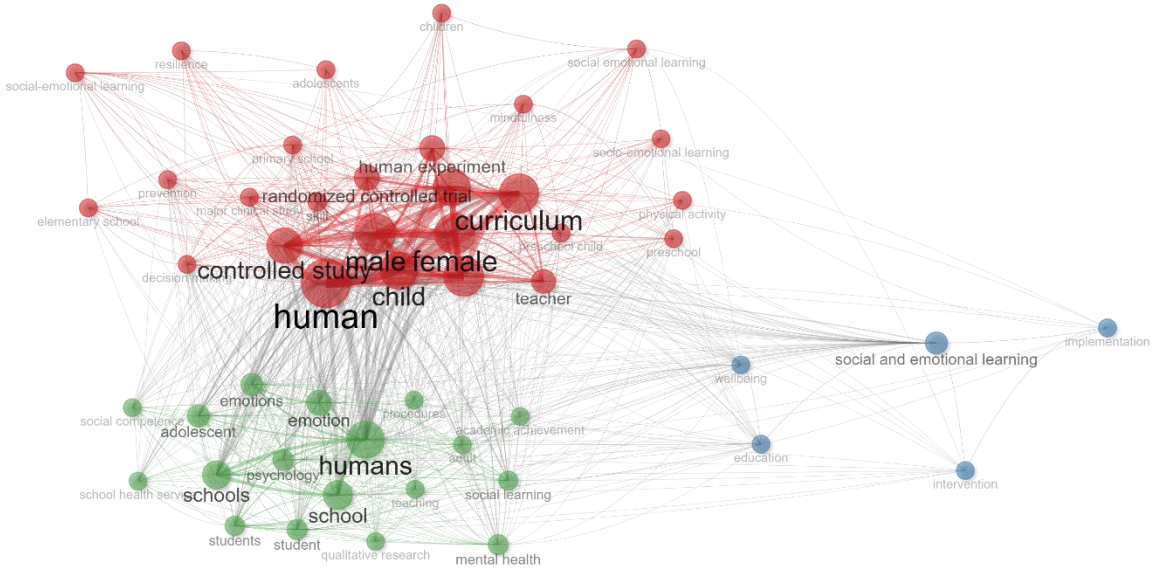

Figure 8. Keyword co-occurrence network with three clusters
Source: Compiled by the author, 2026

Two features deserve attention. First, several of the most prominent nodes (human, male female, controlled study) are database indexing terms rather than author keywords, so the network partly reflects how records are indexed in biomedical and psychological databases. Second, among the labeled nodes, gamification-specific terms are not prominent, while variants of social and emotional learning appear in both the red and blue clusters. This suggests that a large share of the retrieved literature concerns play-related and school-based child development research, and that social and emotional learning is the main conceptual bridge between the search concepts and the health and education literatures.

4.1.5. Emerging Themes

Emerging themes were identified through two complementary signals. In the keyword network, the small and peripheral blue cluster (social and emotional learning, well-being, implementation) marks a topic that is connected to the core but not yet central. In the content sample, several themes appear mainly in publications from 2024 to 2026. Table 4 summarizes these themes. Because the network was not overlaid with publication year, these signals are indicative and should be confirmed with a temporal keyword analysis.

Table 4. Emerging themes and indicative evidence

Theme	Indicative evidence	Sources
Adaptive, developmentally calibrated gamification	Effectiveness tied to the fit between game elements and developmental stage; adaptive designs for preschool and early primary education	Zourmpakis (2026); Lathifah et al. (2025)
Narrative, avatars, and role-play	Drivers of sustained engagement and emotional connection; flow in unplugged coding	Huang & Wang (2025); Kubota et al. (2024)
Unplugged and low-technology designs	Screen-free gamified coding; identified gap in non-digital materials for low-connectivity regions	Huang & Wang (2025); Rios et al. (2026)
Augmented reality and real-time rewards for health routines	Improved tooth-brushing routines and preventive dental visits	Chen et al. (2025)
Emotional intelligence and social-emotional applications	Scenario-based games supporting self-regulation, empathy, and social decision-making	Nunes et al. (2025); Gkintoni et al. (2024)
Preparedness and sustainability education	Playful simulations that ground abstract risks in interactive routines	Ningrum et al. (2026); Rodzi (2024)
Inclusive, co-designed gamification	Co-designed and collaborative tools for children with autism and special needs	Silva et al. (2024); Shaltout et al. (2021)
Open-ended play beyond gamification	Children value agency, peer interaction, and a low-stress climate over rigid mechanics	Kokarida et al. (2026)

Source: Compiled by the author, 2026

Table 4 summarizes themes identified as emerging in research on gamification and play elements for children, based on study and publication characteristics. These themes include developmentally adaptive design, narrative and role-play, non-digital approaches, technology for health, social-emotional competence development, disaster and sustainability education, inclusive design, and open-ended play. These findings indicate diverse directions in gamification development, though their status as emerging themes should be interpreted in light of the bibliometric evidence and publication recency analyzed.

4.1.6. Content Analysis

The content analysis covers 18 publications: one from 2021, one from 2022, one from 2023, seven from 2024, four from 2025, and four from 2026 (Table 5). Nine are systematic, scoping, or meta-analytic reviews, and five report empirical or design-and-development studies of specific tools or programs. The sample spans early childhood and primary education, physical, oral, and mental health, special needs, and preparedness education.

Table 5. Publications included in the content analysis

Source	Context or focus	Main contribution
Shaltout et al. (2021)	Children with special needs	Serious game prototype; gamified learning support with Discrete Trial Training
Semartiana et al. (2022)	Gamification for children in general	Mapped game elements, purposes, and technologies; points, badges, levels, and leaderboards most frequent

Source	Context or focus	Main contribution
Lorenzo-Lledó et al. (2023)	Early childhood and primary education	Thematic analysis of 24 studies; gains in academic and collaborative skills and motivation
Gkintoni et al. (2024)	Physical and mental health, children and adolescents	Conceptual systematic review; scenario-based games for emotional and social skills
Kareem & Khalid (2024)	Early childhood education	Gamification linked to engagement and learning outcomes; peer collaboration
Kubota et al. (2024)	Psychosocial well-being of school-aged children	Scoping review; narratives and avatars used more often than badges or leaderboards
Mohammed et al. (2024)	Motivation of elementary school students	Action research field experiment; supports developmental calibration over isolated rewards
Rodzi (2024)	Environmental sustainability learning	Gamified, low-stress trial-and-error learning about sustainability
Silva et al. (2024)	Children with autism	Collaborative gamification; learning gains and reduced off-task behavior
Wang et al. (2025)	Physical activity and sedentary behavior	Meta-analysis of 16 randomized controlled trials (7,472 children)
Chen et al. (2025)	Oral health management	Systematic review; augmented reality and real-time rewards improved tooth-brushing
Huang & Wang (2025)	Unplugged coding, elementary students	Role-play and cooperative challenges induced flow experiences
Lathifah et al. (2025)	Early childhood education	Meta-analysis; effects depend on tailoring elements to developmental characteristics
Nunes et al. (2025)	Emotional intelligence	Digital application; scenario-based games for self-regulation and empathy
Kokarida et al. (2026)	Children's learning	Qualitative evidence favoring open-ended play over rigid mechanics
Ningrum et al. (2026)	Flood disaster preparedness, early childhood	Systematic review of a gamification framework; scaffolding and calibration
Rios et al. (2026)	Research trends in playful elements	Mapping of trends; gap in non-digital and low-connectivity materials
Zourmpakis (2026)	Preschool and early primary education	Systematic review of adaptive gamification; risks of overload and extrinsic rewards

Source: Compiled by the author, 2026

Table 5 summarizes the analyzed publications by application context and main contribution. The research covers early childhood and primary education, inclusive education, health, social-emotional skills, and environmental sustainability. This diversity shows that gamification and play elements are applied for various purposes, with approaches that include rewards, narrative, collaborative play, and activities without digital devices. This summary serves as the basis for identifying patterns of application and tendencies in research outcomes, without assuming that all approaches have the same impact.

4.1.7. Gamification and Play Elements in Use

Table 6 classifies gamification and play elements into four main categories, namely progress and reward, narrative and immersion, social dynamics, and scaffolding and feedback. Each category has different mechanics and potential developmental impacts, ranging from

sustaining engagement and motivation to supporting social-emotional skills and learning through trial and error and feedback. This classification shows that the benefits of gamification depend not only on the provision of rewards, but also on the design of activities, social interaction, and learning support that match children's needs.

Table 6. Classification and developmental impact of gamification and play elements

Category	Common mechanics	Primary developmental impact	Key evidence
Progress and reward	Points, badges, levels, progress bars	Sustains task engagement and enhances short-term motivation	Semartiana et al. (2022); Lorenzo-Lledó et al. (2023)
Narrative and immersion	Avatars, story arcs, role-playing	Promotes immersion, flow states, and emotional connection	Huang & Wang (2025); Kubota et al. (2024)
Social dynamics	Peer collaboration, team missions	Builds social-emotional skills and collaborative problem-solving	Rios et al. (2026); Huang & Wang (2025); Kareem & Khalid (2024)
Scaffolding and feedback	Instant feedback, freedom to fail, replays	Lowers anxiety and supports iterative trial-and-error learning	Lorenzo-Lledó et al. (2023); Ningrum et al. (2026)

Source: Compiled by the author based on Semartiana et al. (2022), Lorenzo-Lledó et al. (2023), Huang and Wang (2025), Kubota et al. (2024), Rios et al. (2026), Kareem and Khalid (2024), and Ningrum et al. (2026).

Points, badges, levels, and leaderboards are the most frequently implemented components in child-centered gamified platforms (Lorenzo-Lledó et al., 2023; Semartiana et al., 2022). These components support progression tracking, clear goal setting, and rapid feedback, which together structure the child's learning process (Chen et al., 2025; Lorenzo-Lledó et al., 2023; Shaltout et al., 2021). In educational contexts, mobile applications and tablet games are the dominant delivery vehicles for these mechanics (Chen et al., 2025; Lorenzo-Lledó et al., 2023; Semartiana et al., 2022).

Beyond traditional reward structures, immersive narrative features such as storytelling, avatars, and role-playing strongly drive sustained engagement (Huang & Wang, 2025; Kubota et al., 2024; Lathifah et al., 2025). In unplugged coding activities, role-playing heroes and engaging in cooperative challenges significantly induced flow experiences among elementary students (Huang & Wang, 2025). A scoping review of psychosocial interventions found that narratives and avatars are used more frequently than badges or leaderboards to foster emotional connection (Kubota et al., 2024). The relative frequency of elements therefore depends on the domain: generic child-centered platforms lean on progress and reward mechanics, whereas psychosocial interventions lean on narrative.

Table 6 classifies the elements into four categories and links each to its primary developmental impact. Progress and reward mechanics sustain task engagement and enhance short-term motivation. Narrative and immersion features promote flow and emotional connection. Social dynamics such as peer collaboration and team missions build social-emotional skills and collaborative problem-solving. Scaffolding and feedback features, including instant feedback, freedom to fail, and replays, lower anxiety and support iterative trial-and-error learning. Beyond these categories, delivery formats vary and include augmented reality with real-time rewards (Chen et al., 2025), unplugged role-playing activities (Huang & Wang, 2025), scenario-based games (Gkintoni et al., 2024; Nunes et al., 2025), and

gamified software built on Discrete Trial Training (Shaltout et al., 2021; Silva et al., 2024). The choice of mechanics should therefore be guided by the developmental objective and implementation context rather than by the number of game elements included.

4.1.8. Contexts, Age Groups, and Purposes

A. Educational contexts

In primary and early childhood education, gamification is widely used to teach mathematics, science, language, and coding (Huang & Wang, 2025; Lorenzo-Lledó et al., 2023). Playful interfaces create safe trial-and-error environments that reduce task-related stress and anxiety while building problem-solving skills (Lorenzo-Lledó et al., 2023; Rodzi, 2024). Playful simulations have also shown promise as pedagogical scaffolding in disaster preparedness and environmental sustainability, where they ground abstract risks in interactive routines (Rodzi, 2024; Ningrum et al., 2026).

B. Health and behavioral contexts

Pediatric health and behavioral domains increasingly use gamification to support physical, mental, and oral health (Chen et al., 2025; Gkintoni et al., 2024; Rios et al., 2026). Physical activity interventions target moderate-to-vigorous activity and body weight (Wang et al., 2024). Oral health applications target tooth-brushing routines and preventive dental visits (Chen et al., 2025). Psychosocial and emotional applications target well-being, self-regulation, empathy, and social decision-making (Gkintoni et al., 2024; Kubota et al., 2024; Nunes et al., 2025). A further line of work serves children with autism and other special needs through co-designed and collaborative gamified software (Shaltout et al., 2021; Silva et al., 2024).

C. Age groups

The sources cover early childhood and preschool (Kareem & Khalid, 2024; Lathifah et al., 2025; Zourmpakis, 2026), elementary and primary school (Huang & Wang, 2025; Mohammed et al., 2024), school-aged children in general (Kubota et al., 2024), and children and adolescents together (Gkintoni et al., 2024; Wang et al., 2024). One thematic review reported that most primary-education studies involved students aged 10 to 12 (Lorenzo-Lledó et al., 2023), which suggests that evidence for younger children may be thinner.

D. Purposes

Across these contexts, gamification serves three broad purposes: supporting learning, shaping behavior and routines, and managing health (Gkintoni et al., 2024; Rios et al., 2026; Semartiana et al., 2022). Increasing engagement and motivation is the shared mechanism behind all three.

4.1.9. Reported Outcomes and Research Gaps

Reviews of early childhood and primary education report improvements in academic and collaborative skills and in motivation (Lorenzo-Lledó et al., 2023), and a meta-analysis found a significant positive effect of gamification when game elements are tailored to developmental characteristics (Lathifah et al., 2025). In health, a meta-analysis of 16 randomized controlled trials involving 7,472 children found that gamification interventions significantly increased moderate-to-vigorous physical activity and lowered body mass index, although sedentary time was unchanged (Wang et al., 2024). Digital platforms with augmented reality and real-time rewards improved tooth-brushing routines and preventive dental visits (Chen et al., 2025). Interactive scenario-based games supported emotional self-regulation, empathy, and social decision-making in school settings (Gkintoni et al., 2024; Nunes et al., 2025), and co-designed gamified software supported learning gains and reduced off-task behavior in children with autism and special needs (Shaltout et al., 2021; Silva et al., 2024).

The sources converge on five limitations. First, effectiveness is heavily contingent on developmental calibration rather than on isolated reward mechanisms (Mohammed et al., 2024; Ningrum et al., 2026; Zourmpakis, 2026). Second, an overemphasis on extrinsic reinforcers such as points and leaderboards can undermine intrinsic motivation, induce social pressure, or distract children from the underlying learning objective (Wang et al., 2024; Zourmpakis, 2026). Third, when game elements exceed a young child's processing capabilities, the resulting cognitive overload leads to minimal or counterproductive outcomes (Lathifah et al., 2025; Zourmpakis, 2026). Fourth, a prominent gap remains in non-digital and low-connectivity materials for resource-limited regions, where hardware and internet access are constrained (Gkintoni et al., 2024; Rios et al., 2026). Fifth, qualitative evidence emphasizes that children value open-ended play elements, such as agency, peer interaction, and a low-stress climate, over rigid game mechanics alone (Kokarida et al., 2026). The unchanged sedentary time reported by Wang et al. (2024) is a further reminder that gamification does not shift every target behavior.

4.2. Discussion

4.2.1. Integrating the Bibliometric and Content Findings

The bibliometric and content analysis findings offer two complementary perspectives on the development of research on gamification and play elements for children. The bibliometric analysis describes publication patterns, the contributions of authors and publication sources, and the links among themes, while the content analysis shows the variety of applications and outcomes reported in the literature, ranging from oral health to flood disaster preparedness. This diversity shows that gamification and play elements are applied for various purposes and in various contexts of child development. However, the diversity of publication sources and the absence of a dominant group of authors are not sufficient to conclude that the field is still in a consolidation stage. This pattern may also relate to differences in disciplines, application purposes, and research context characteristics.

These findings need to be understood in relation to earlier mapping studies. Swacha (2021) bibliometrically mapped the development of gamification research in education, while Behl et al. (2022) combined a systematic review and bibliometric analysis on gamification and e-learning for children. Ríos et al. (2026) more specifically mapped research trends in gamification and the development of play elements for children. This study complements those mappings by reading bibliometric patterns together with the content analysis findings from selected publications. Thus, its contribution lies not only in mapping the development and thematic structure of the research, but also in linking those patterns to the variety of application contexts, design mechanisms, and outcomes reported in the analyzed publications. Nevertheless, the limited scope of the content analysis means that the relationship between bibliometric structure and substantive findings should be understood as a complementary interpretation, not as evidence that the patterns in the two analyses are directly related.

Geographically, the bibliometric data show the representation of institutions and journals from Indonesia and Brazil in the research corpus. Meanwhile, the content analysis identifies a need for non-digital or low-technology materials that can be used in environments with limited connectivity and devices (Gkintoni et al., 2024; Ríos et al., 2026). These two findings point to different aspects of the field's development. The available data do not prove that contributions from Indonesia or Brazil specifically focus on developing low-technology materials. Therefore, this approach is more appropriately positioned as an opportunity for

further research, including the development and testing of learning tools without computers, as shown in the study by Huang and Wang (2025).

4.2.2. Implications for Design and Practice

Findings from the analyzed publications show that the implementation of gamification needs to consider learning objectives, children's developmental characteristics, and the context of use. Several studies report outcomes related to motivation, engagement, and learning, but these outcomes cannot be generalized to all gamification mechanisms or all groups of children (Mohammed et al., 2024; Ningrum et al., 2026; Zourmpakis, 2026). Hence, the complexity of game elements should be adjusted to users' abilities and needs. Overly complex designs may increase processing load, although the impact still depends on children's characteristics and the design of the intervention (Lathifah et al., 2025; Zourmpakis, 2026).

The use of points, rewards, and leaderboards also needs to consider the purpose and context of implementation. These elements can be used to provide information about progress, but they do not always increase intrinsic motivation. The literature on motivation shows that the impact of external rewards depends on the form and conditions in which they are given (Deci et al., 1999; Ryan & Deci, 2000). Therefore, reward elements can be combined with narrative, social interaction, and feedback without assuming that one design combination will be effective for all children (Wang et al., 2024; Zourmpakis, 2026).

Feedback, opportunities to try again, and space to learn from mistakes are design aspects that also need to be considered. These features can support the learning process through trial and strategy adjustment, in line with the concept of scaffolding in learning (Wood et al., 1976). Several of the reviewed studies report the use of feedback and repeat opportunities as part of gamification design (Lorenzo-Lledó et al., 2023; Ningrum et al., 2026). However, the available findings are not sufficient to state that each of these features separately produces the same impact across contexts. Likewise, open-ended play and peer interaction can be considered as complements to more structured mechanisms, especially when the design needs to provide room for children's choice and participation (Kokarida et al., 2026). Collaborative tool development has also been reported in research involving children with special needs (Shaltout et al., 2021; Silva et al., 2024), although its implementation still requires adjustment to users' needs.

In the health context, the review by Wang et al. (2025) shows that gamification interventions are associated with increased moderate-to-vigorous physical activity, but show no significant change in sedentary behavior. This finding underscores the importance of distinguishing the targeted outcome indicators. An increase in physical activity does not in itself indicate reduced sedentary time. Therefore, intervention designs need to be formulated based on the specific behavior to be achieved and evaluated using appropriate indicators.

4.2.3. Limitations

This study has several limitations. First, the bibliometric dataset was sourced from a single database and limited to open access articles with abstracts. These criteria may affect the representation of publications by region, source, and access policy. The dataset also includes repository documents and conference proceedings, so not all documents can be treated as journal articles that have undergone peer review. Field-of-study labels were assigned automatically and are not mutually exclusive, while the keyword network is dominated by database indexing terms. Therefore, both outputs are more appropriately used as general indicators than as complete representations of the conceptual structure of the research field. Several figures read from the exported charts are also approximate.

Second, the identification of potentially emerging themes was based on peripheral position in the network and the appearance of recent publications, not on an analysis of temporal thematic change. Thus, peripheral position and recency of publication cannot yet be treated as adequate evidence that a theme is truly emerging. Third, the content analysis used a purposive sample of 18 publications, including nine review articles. The analysis describes findings as reported in the selected publications and does not re-extract all primary studies cited by those review articles. The sample also includes several 2026 publications that fall outside the time range of the bibliometric dataset. This difference in scope limits direct comparability between the two analyses. Overall, the results should be understood as a bibliometric mapping supplemented by content interpretation of selected publications, not as a systematic synthesis of all empirical evidence on gamification and play elements for children.

5. Conclusion

Research on gamification and play elements for children expanded between 2020 and 2025, although its interdisciplinary structure, broad publication outlets, and thematic distribution indicate a diverse field. By combining bibliometric mapping with content analysis, this study connects publication patterns and research themes with the applications and outcomes reported in selected publications. The findings identify points, badges, levels, and leaderboards as common mechanics, while narrative, social play, and scaffolded feedback represent additional design approaches associated with engagement and learning experiences. Reported outcomes span education, health, and social-emotional development, but their interpretation depends on the context and characteristics of the interventions examined. This study provides a basis for understanding the field beyond publication trends alone and highlights the need to compare design elements directly, establish age-specific and long-term evidence, and develop non-digital alternatives for resource-limited settings. These efforts may support more context-sensitive and inclusive playful designs for children.

5.1. Conflict of Interest Statement

The author declares no financial or personal relationships that could reasonably be perceived as competing interests in connection with this publication.

5.2. Author Contributions

All works in this article were carried out solely by the author.

5.3. Funding Statement

No funding was received for this research.

5.4. Informed Consent

Not applicable. The study analyses published bibliographic records and publications and involves no human participants, interviews, or collection of personal data.

5.5. Ethical Approval

Not applicable. The research is a bibliometric and documentary content analysis of publicly available publications and involves no human or animal subjects and no primary data collection.

5.6. Data Availability

No new empirical data were generated. The Lens.org export underlying the bibliometric analysis, including the search string, the year, document-type, and access filters recorded in

Table 3, and the final dataset of 4,329 records, together with the coding sheet used for the eighteen publications in the content analysis, are available from the corresponding author [D.D.A.] on reasonable request. The analyzed publications themselves are publicly accessible.

5.7. Declaration of Generative AI and AI-assisted Technologies

During the preparation of this manuscript, the author utilized Claude (Anthropic) for language editing and clarity improvement. All outputs generated with the assistance of the tool were critically reviewed and revised by the author to ensure factual accuracy, consistency with the Lens.org output and the coding records, and adherence to academic writing standards. The author assumes full responsibility for the integrity and content of this manuscript.

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