



Gamification in Contextual Learning-Based Approaches: A Systematic Review of Empirical Research

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ABSTRACT

Gamification is widely used to increase student motivation and participation, yet evidence on its effective integration with Contextual Teaching and Learning (CTL) remains fragmented. This systematic review aims to map how gamification elements are integrated with CTL components and how the integration relates to reported learning outcomes. The review followed PRISMA 2020 guidelines through a structured search in Scopus, screening based on predefined inclusion and exclusion criteria, and methodological quality assessment prior to synthesis. Included studies were analyzed narratively by coding gamification elements, CTL implementation (authentic context, inquiry/discovery, collaboration, and reflection), research design, educational level, and outcome indicators. The synthesis suggests that integration is most consistently associated with positive outcomes when game elements are embedded in authentic, context-rich tasks and inquiry-oriented activities, supported by clear learning goals and formative feedback. However, the current evidence base is constrained by limited coverage of early childhood education, short intervention durations, and incomplete reporting of implementation fidelity. Future research should expand educational contexts, improve transparency in documenting CTL enactment and gamification use, and apply longer-duration designs to evaluate sustained outcomes.

1. Introduction

Gamification is becoming an increasingly popular approach in education as it integrates game features such as points, levels, challenges, and feedback into learning activities. This design can create a more interactive learning experience as well as encourage student participation through progress monitoring and timely feedback. Hamari et al. (2014) assert that the element of play can transform classroom dynamics from passive acceptance to active engagement through a structure of goals, challenges, and rewards that keep students motivated to complete

learning tasks. These findings are in line with He et al. (2024) who show that progress visualization helps students be more motivated to complete academic challenges. However, the effectiveness of gamification is not always consistent in all contexts. Li et al. (2024) warn that gamification applied on a "surface" basis (simply adding points or badges) without alignment with instructional goals and meaningful learning processes often does not produce lasting learning impacts. This means that gamification requires a design that is not only interesting, but also inherent in learning activities that really support the achievement of competencies.

In line with the increasing use of media and game-based learning platforms, a number of studies in *the Journal of Educational Sciences* report that the use of educational apps and games such as Kahoot, Wordwall, Gimkit, Baamboozle, and Quizizz can support engagement and learning outcomes in a variety of classroom contexts, although their effectiveness still depends on the alignment of design with the learning objectives and pedagogical strategies used (Khayyirah et al., 2024; Rosyida et al., 2025; Ardiana et al., 2025; Adinda et al., 2025; Putri & Pujiawati, 2025).

Conceptually, gamification is understood as the process of incorporating game design elements such as points, badges, leaderboards, challenges, levels, and feedback into non-game learning activities to increase motivation and engagement (Deterding et al., 2011; Kapp, 2012; Dichev & Dicheva, 2017). Gamification is not just about "making learning a game", but rather reimagining the learning experience through a structure of goals, rules, progress, and feedback that keeps students engaged in completing tasks. A theoretical framework that is often used to explain this mechanism is the *Self-Determination Theory* (SDT) which states that intrinsic motivation develops when the psychological needs of competence, autonomy, and interconnectedness are met (Ryan & Deci, 2000; Deci et al., 2001).

In the context of learning, feedback and progress can strengthen a sense of competence, elective options can support autonomy, and teamwork can strengthen connectedness. However, the literature also emphasizes that gamification is potentially ineffective or even counter-productive if its design overemphasizes external competition and point accumulation without a clear instructional goal (Hanus & Fox, 2015; Francisco-Aparicio et al., 2013). Thus, game elements are supposed to serve as pedagogical *scaffolding* that helps students survive challenging learning processes such as exploration, problem-solving, and reflection, not just as visual embellishments.

To ensure gamification serves as a meaningful instructional strategy, a strong pedagogical framework is needed. *Contextual Teaching and Learning* (CTL) offers such a framework by emphasizing the interconnectedness of academic materials to real-world situations, so that learning becomes relevant, authentic, and transferable to the context of life (Johnson, 2002; Slameto, 2015). In CTL, knowledge is not (Placeholder2) presented in isolation, but is built through activities that connect concepts with real problems, investigative activities, discussions, and reflections. This approach is in line with constructivism, which emphasizes that learners build understanding through meaningful interactions with the environment. The

components of CTL generally include authentic contexts, discovery/inquiry-based activities, collaboration, reflection, and community-based learning (Bransford et al., 2000; Khotimah & Masduki, 2016). When these components are well integrated, students tend to develop deeper conceptual understanding, problem-solving skills, and the ability to transfer knowledge to new situations (Putnam & Borko, 2000; Kilpatrick et al., 2003).

The integration of gamification and CTL is the focus of research because of its potential to combine the "engagement drive" of game elements with the "depth of meaning" of contextual tasks. In good integration, game elements are not superficially added, but rather integrated into the learning process, for example guiding the progress of investigations, providing feedback during problem-solving, encouraging collaborative work, and facilitating reflection. A number of studies report that this integrated design can help students stay diligent in completing contextual tasks and understand the application of concepts to realistic situations (Camacho-Sánchez et al., 2022). However, the existing literature still leaves an important question: not all studies explain in detail how gamification elements are mapped to CTL (authentic context, inquiry, collaboration, reflection) components, making it difficult to distinguish a design that only "adds an element of play" from a design that actually embeds gamification into the contextual learning process.

Based on these conditions, the research gap related to gamification–CTL integration can be formulated specifically on three aspects. First, many studies report outcomes (e.g. motivation, engagement, or achievement) but do not always describe the quality of CTL implementation and how elements of play support authentic tasks, inquiry, collaboration, and reflection, so the mechanisms of success and failure are less clear. Second, the research methods used tend to be dominated by quantitative designs with relatively short intervention durations, which have the potential to cause novelty effects and limit conclusions about sustainable impacts. Third, the context and population of the study are not evenly distributed; Some levels and fields of study are more often researched, while certain contexts, especially early childhood education, are still rarely discussed. Therefore, SLRs are needed to map how gamification-CTL integration is designed and studied, as well as how those integration patterns relate to reported learning outcomes.

In order for the SLR synthesis to be analytical and cross-study comparable, this study uses a conceptual framework that connects three components: (1) gamification design features, (2) activated CTL components, and (3) reported learning outcomes. Gamification features are classified as mechanics (e.g. points/badges/levels), dynamics (e.g. challenges, collaborations, competitions), and feedback (e.g. progress and instant feedback). The CTL component is coded based on the implementation of authentic context, inquiry/discovery, collaboration, reflection, and connectedness to real situations. Learning outcomes are grouped into affective outcomes (e.g., motivation and engagement), cognitive outcomes (e.g., achievement/understanding of concepts), and skills (e.g., problem-solving, critical thinking, and transfer). This framework allows for an assessment of *alignment* between game elements and CTL activities so that SLR findings can explain the

"when and why" patterns of gamification-CTL integration contribute to learning outcomes, rather than simply reporting the frequency of a particular element.

This review is guided by three research questions: (1) what research methods are used to investigate and evaluate CTL-based gamification; (2) how gamification is designed and implemented at various levels of education; and (3) how gamification elements are combined with the core components of CTL and what learning outcomes are reported. The purpose of this study is to synthesize empirical evidence (2020-2024) on the integration of CTL-based gamification by examining the research methods used, design and implementation patterns at various levels of education, as well as their relationship with reported learning outcomes.

2. Methodology

Search Strategies and Data Sources

This systematic literature review was conducted by a structured search of the Scopus database for the 2020-2024 period. Scopus was chosen because it provides broad multidisciplinary coverage and consistent metadata that supports search processes and search replication. However, restrictions on a single database could potentially miss studies that are indexed exclusively on educational databases such as ERIC or citation indexes such as the Web of Science. Therefore, the limitations of database coverage are recognized and recommended to be expanded in the next update of the review. The search uses three groups of terms combined with Boolean operators, namely: (1) gamification/educational game terms, (2) context/CTL terms, and (3) educational/learning terms. The query structure is constructed as follows: (Gamification terms) AND (Context/CTL terms) AND (Education terms). All records of search results are exported to the reference manager for organizing and removing duplicates.

Study Selection Protocol and Process (PRISMA 2020)

The study selection process follows the guidelines of PRISMA 2020. An initial search yielded 857 records. After the elimination of duplication and the implementation of document limitations (journal articles, final stages, and peer review), the number of records was reduced to 137. Next, title and abstract screening was carried out to assess the relevance to the topic of gamification integration and Contextual Teaching and Learning (CTL). Articles that pass this stage are then reviewed at the full-text level. A total of 28 articles were assessed in full-text form, and 24 empirical studies met all inclusion criteria for inclusion in the final synthesis. The study selection process is summarized in Figure 1.

Inclusion and Exclusion Criteria

Eligibility criteria are established to ensure only empirical studies relevant to the focus of the review are synthesized. Inclusion criteria include: (1) original empirical research articles indexed by Scopus in 2020-2024; (2) focus on gamification that is

integrated with CTL or contextual learning concepts that are explicitly stated; (3) carried out in an educational environment with students (basic education to higher education); (4) report learning outcomes, such as motivation, engagement, achievement, or high-level thinking skills; (5) the full text is available in English or Indonesian; and (6) published in the journal peer-reviewed journal articles in the final stage. Exclusion criteria include: (1) conceptual articles, narrative reviews, or meta-analyses; (2) book chapters, editorials, conference proceedings, theses/dissertations; (3) studies that do not explicitly demonstrate CTL integration; (4) "serious game" studies that do not explain pedagogical/CTL integration; (5) studies that only contain teacher/parent data with no results on students; and (6) the full text is unavailable, duplicated, or the article is retracted.

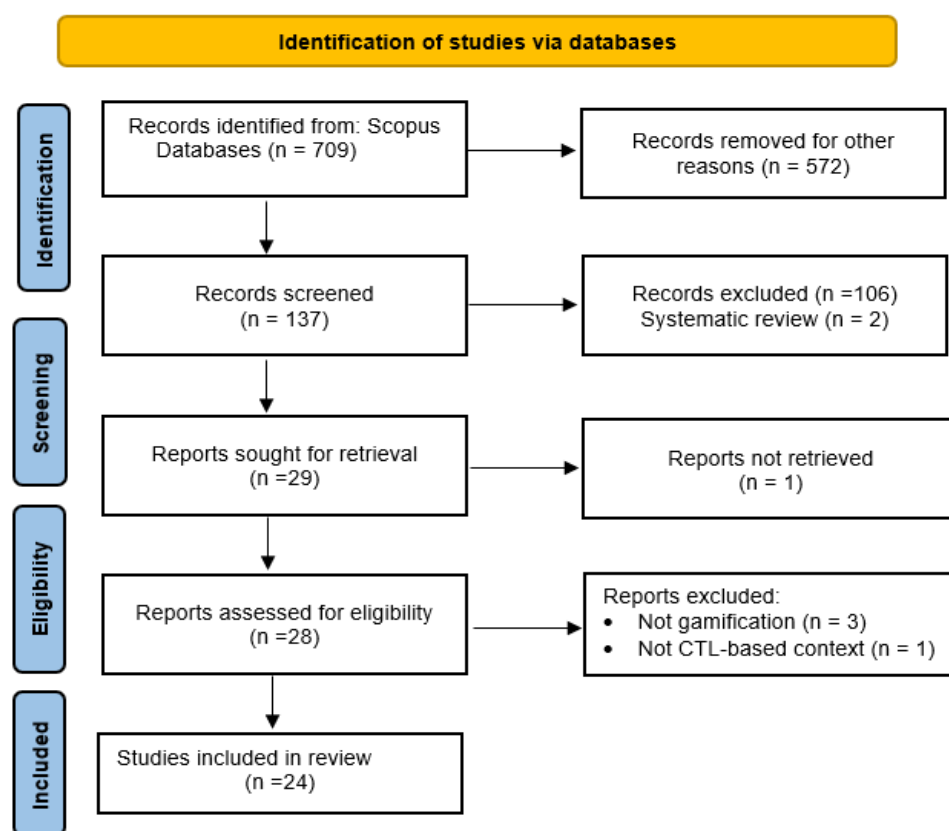


Figure 1. Study Selection Flow Chart Based on PRISMA 2020

Data Extraction

Data extraction was performed using structured extraction sheets to ensure consistency between studies. The data collected included: author and year of publication, context and subject, level of education, research design, sample characteristics, details of the intervention (gamification elements and CTL components implemented), measurement instruments, duration of intervention, *implementation fidelity* reporting, and reported learning outcomes. To facilitate cross-study synthesis, gamification elements and CTL components are coded based on categories consistent with the conceptual framework of the review.

Quality Assessment

Quality assessments were conducted to assess the strength of the evidence and the transparency of study reporting. The instruments used were adapted to the research design: ROBINS-I was used for non-random/observational quantitative studies, while *the Critical Appraisal Skills Programme (CASP)* was used for qualitative studies. The assessment domains include, among others, clarity of design and procedure, adequacy of sample descriptions and context, transparency of intervention implementation, suitability of instruments/outcome measures, and completeness of outcome reporting. Each study was categorized as high, medium, or low quality based on the fulfillment of the criteria on the instrument used. Quality categories are used in synthesis by: (1) giving stronger interpretive weight to high-quality studies, (2) marking findings from low-quality studies as tentative, and (3) using quality assessments to explain differences in outcomes between studies (e.g. when positive impacts arise primarily on studies with limited implementation reporting).

Data Analysis and Synthesis

The synthesis was done narratively to integrate quantitative and qualitative evidence, with a focus on design patterns and the alignment between gamification elements and CTL components. Thematic analysis was used to identify themes across studies, through the following steps: (1) initial coding on gamification elements, CTL components, and types of learning outcomes; (2) grouping the code into design themes (e.g. "authentic tasks + progress/feedback", "collaboration + challenges", or "points-based competitions"); and (3) comparison of themes with learning outcomes reported in each study. This approach allows the review to not only report frequency, but also explain the "when and why" pattern of gamification-CTL integration tends to produce specific learning outputs.

3. Results and Discussion

Research Methods in CTL-Based Gamification Studies

A total of 24 studies met the inclusion criteria and employed diverse research approaches. The distribution of research methods is summarized in Table 1. Overall, the evidence base is dominated by designs that prioritize measurable outcomes (e.g., changes in engagement, motivation, or achievement), indicating that CTL-based gamification research more often evaluates effects than documents implementation processes in depth. Qualitative and mixed-method studies complement this trend by explaining how classroom context, implementation mechanisms, and learner experiences shape the success of gamification-CTL integration, which is essential for interpreting why similar design features may yield different outcomes across settings. This methodological profile suggests that future reviews and primary studies would benefit from stronger reporting standards that capture implementation fidelity and contextual characteristics alongside outcome

measures, so that cross-study synthesis can move beyond “what works” toward clarifying “what works, for whom, and under what conditions.”

Table 1. Distribution of Research Methods (n=24)

Research Methods	Frequency	Percentage (%)
Quantitative (Quasi-experimental & Survey)	16	66.7
Qualitative (Interviews & Focus Groups)	5	20.8
Mixed Method	2	8.3
Research and Development (R&D)	1	4.2
Total	24	100

Source: Author’s synthesis

Education Levels and Context Coverage

The distribution of studies by education level is presented in Table 2. The included evidence indicates that CTL-based gamification has been implemented across primary, secondary, and higher education contexts. However, no empirical studies were identified in early childhood education within the included set. This absence highlights a clear research gap, particularly because early childhood learning often emphasizes contextual experiences and engagement through play—features that may align conceptually with gamification but require developmentally appropriate implementation. The lack of evidence does not imply ineffectiveness; rather, it indicates that the current empirical base is not yet sufficiently broad to support generalization to early childhood settings. Consequently, future studies should consider age-appropriate gamification designs that emphasize exploration, guided inquiry, simple narratives, and supportive feedback rather than competitive ranking systems, while also reporting how contextual tasks are adapted to young learners’ cognitive and social development.

Table 2. Distribution of Studies by Education Level (n=24)

Education Level	Number of Studies	Percentage (%)	Key Results
Elementary School (SD/MI)	9	37.5	Motivation, Engagement, Achievement
Secondary School (Junior High School/High School)	8	33.3	Critical Thinking, Engagement, Retention
Higher Education	7	29.2	Learning Outcomes, Satisfaction, Problem Solving
Early Childhood Education (PAUD/TK)	0	0	The Gap Requires Research

Source: Author’s synthesis

Integration Patterns and Reported Learning Outcomes

The frequency of gamification elements and activated CTL components identified across the included studies is reported in Table 3, while the most frequently reported learning outcomes are summarized in Table 4. Across studies, gamification is

commonly implemented through progression- and reinforcement-oriented mechanics (e.g., points, levels, and badges), whereas CTL is most frequently operationalized through authentic contexts and inquiry/discovery activities. This pattern suggests that many interventions position game features as structured support for completing contextual tasks rather than as stand-alone motivational add-ons. When game feedback and progress signals are closely tied to authentic task completion and inquiry milestones, learners’ participation can be sustained as part of the learning process rather than being driven primarily by external rewards. Conversely, when game elements are emphasized without clear linkage to contextual problem-solving activities, improvements may be limited to short-term participation rather than deeper learning processes.

Beyond identifying frequently used elements, the synthesis indicates that learning outcomes are most often reported in affective and participatory domains (motivation and engagement), followed by cognitive outcomes (achievement or test scores) and higher-order thinking skills. Relatively fewer studies report outcomes related to transfer or application, which may reflect the short duration of many interventions and the limited use of measures that capture longer-term learning. Taken together, these findings suggest that the field would benefit from (1) clearer reporting of how CTL components are enacted in practice, (2) more consistent outcome measures that allow cross-study comparison, and (3) longer-duration designs capable of testing whether contextualized gamification supports sustained learning and transfer beyond immediate classroom engagement.

Table 3. Gamification Element Frequency and CTL Components (n=24)

Elements/Components	Frequency	Percentage (%)
Gamification Elements		
Points/Scores	22	91.7
Level/Progress	19	79.2
Badges/Certificates	18	75.0
Prizes	15	62.5
Leaderboard	12	50.0
CTL Components		
Authentic Context	21	87.5
Investigation-Based Activities	20	83.3
Collaboration/Social Learning	19	79.2
Reflection/Self-Assessment	17	70.8
Learning Community	14	58.3

Source: Author’s synthesis

Table 4. Reported Learning Outcomes (n=24)

Learning Outcomes	Number of Studies	Percentage (%)
Intrinsic Motivation	20	83.3
Student Engagement	19	79.2
Learning Achievement/Test Scores	16	66.7
High-Level Thinking Skills	14	58.3
Knowledge	12	50.0
Transfer/Application		

Source: Author’s synthesis

Conceptual Interpretation and Synthesis Contribution

The synthesis indicates that the effectiveness of CTL-based gamification is better explained by the alignment between game features and CTL learning processes than by the mere presence of gamification components. In many studies, game mechanics function as pedagogical scaffolds that help learners persist through contextual inquiry: progress indicators signal meaningful advancement toward task goals, feedback clarifies what has been achieved and what remains, and collaborative structures support social learning around problem-solving. This interpretation extends beyond simply confirming established theories, because it specifies how a design mechanism links motivation and engagement to contextual learning activities. In practical terms, CTL-based gamification can be understood as a “contextualized engagement system,” where gamification organizes learners’ participation during authentic tasks, inquiry/discovery, collaboration, and reflection. This conceptual framing helps reconcile mixed findings in the gamification literature by highlighting that outcomes depend on whether game features reinforce the CTL process or operate as a separate reward layer around otherwise non-contextual activities.

Methodological Limitations of the Reviewed Studies

Although many studies report positive outcomes, recurring methodological limitations constrain the strength and generalizability of conclusions. First, intervention durations are often short, making it difficult to separate sustained learning effects from novelty-related engagement that emerges when learners first encounter gamified features. Second, many studies rely on quasi-experimental designs with convenience sampling and limited control of contextual variables, which reduces confidence in causal interpretations across settings. Third, implementation fidelity reporting is frequently insufficient: studies do not consistently document whether CTL components were implemented as intended, how learners interacted with gamified features, or how teacher facilitation shaped the inquiry and reflection process. This is particularly important because CTL-based gamification is sensitive to instructional enactment rather than tool presence alone. Fourth, outcome instruments vary widely and are not always comparable across studies, limiting the ability to synthesize effects beyond broad thematic conclusions. These limitations indicate the need for more transparent reporting, stronger fidelity documentation, and more consistent measurement practices to support replication and robust cross-study comparisons.

Practical Implications and Future Research Agenda

For educational practice, the synthesis suggests that CTL-based gamification should be designed as an instructional structure rather than an add-on reward layer. Educators are advised to (1) define explicit learning goals and link game progress to evidence of authentic task completion or inquiry milestones; (2) embed game mechanics within context-rich tasks rather than separating them into unrelated drills; (3) design collaboration as joint problem-solving supported by shared goals and roles; and (4) include reflection checkpoints so that feedback supports strategy

improvement and conceptual understanding. In line with evidence reported in the Journal of Educational Sciences, classroom platforms and educational games (e.g., Kahoot, Wordwall, Gimkit, Baamboozle, and Quizizz) can support engagement and learning outcomes when integrated into structured strategies aligned with learning objectives (Khayyirah et al., 2024; Rosyida et al., 2025; Ardiana et al., 2025; Adinda et al., 2025; Putri & Pujiawati, 2025).

Accordingly, professional development should focus not only on tool operation but on designing authentic CTL tasks, inquiry sequences, and formative feedback routines that make gamification meaningful. For future research, priorities include expanding empirical work to early childhood education with developmentally appropriate designs, adopting longer-duration and longitudinal approaches to examine retention and transfer, strengthening fidelity and context reporting (including the types of authentic tasks and inquiry structures used), and examining equity and inclusivity impacts across diverse student populations and technology access conditions. Addressing these priorities will improve both the explanatory power of future syntheses and the practical guidance available

4. Conclusion

This systematic review examines how gamification has been integrated with Contextual Teaching and Learning (CTL) and what learning outcomes are commonly associated with this integration. Overall, the synthesis indicates that CTL-based gamification is most meaningful when game features are embedded within authentic, context rich tasks and structured inquiry processes, rather than added as a separate reward layer. The value of integration lies in the alignment between game mechanics such as progress structures and formative feedback and CTL components that emphasize authentic context, inquiry/discovery, collaboration, and reflection. In this sense, the objective of the study was achieved because the review successfully mapped dominant research approaches and clarified how design alignment is connected to reported outcomes across educational settings. However, the current evidence base remains constrained by limited reporting of implementation fidelity, short intervention durations, and uneven coverage of educational contexts. Future research should broaden the context of investigation, particularly in early childhood education with developmentally appropriate designs, employ longer duration or longitudinal approaches to evaluate sustained impacts, and strengthen transparency in documenting CTL enactment and gamification use. These steps are necessary to improve comparability across studies and support more robust, actionable conclusions for research and practice.

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