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Mapping Gamification Research in Higher Education: A Scoping Review of Designs, Outcomes, and Research Gaps

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ABSTRACT

Gamification is widely used in higher education, but the research differs in design, duration, game elements, and measured outcomes. This study mapped recent empirical research on gamification in higher education and identified areas that require further investigation. A scoping review was conducted using the JBI approach and reported with reference to PRISMA-ScR. Searches covered ERIC, the Directory of Open Access Journals, Crossref-indexed publisher platforms, and reference lists for peer-reviewed studies published from 2019 to 2025. The documented search identified 74 records, of which 20 studies met the inclusion criteria. Data were charted by discipline, sample, research design, intervention duration, gamification elements, outcome categories, and reported limitations. Six studies used experimental or randomized designs, seven used quasi-experimental or comparative designs, three used mixed methods, two used longitudinal or cohort comparisons, and two used single-group interventions. Learning performance was the most frequently examined outcome, followed by motivation, engagement, individual differences, and retention. Points, leaderboards, quizzes, challenges, feedback, badges, progress indicators, narratives, and escape-room activities were commonly combined. The evidence was concentrated in single courses, short interventions, and STEM-related subjects. Positive findings were common, but the diversity of interventions and measures did not support a general causal conclusion. Future studies should report intervention components clearly, include delayed assessments, examine lower-performing and competition-averse students, and use multi-course or multi-institutional designs.
Keywords: gamification, higher education, learning outcomes, scoping review

ABSTRAK

Gamifikasi banyak digunakan di perguruan tinggi, tetapi penelitian yang tersedia berbeda dalam desain, durasi, unsur permainan, dan hasil yang diukur. Penelitian ini memetakan penelitian empiris terbaru tentang gamifikasi di pendidikan tinggi serta mengidentifikasi bidang yang masih memerlukan kajian. Scoping review dilakukan dengan pendekatan JBI dan dilaporkan dengan mengacu pada PRISMA-ScR. Penelusuran mencakup ERIC, Directory of Open Access Journals, platform penerbit terindeks Crossref, dan daftar pustaka untuk penelitian peer-reviewed yang terbit pada 2019-2025. Catatan penelusuran memuat 74 artikel, dan 20 penelitian memenuhi kriteria inklusi. Data dipetakan berdasarkan disiplin ilmu, sampel, desain penelitian, durasi intervensi, unsur gamifikasi, kategori hasil, dan keterbatasan yang dilaporkan. Enam penelitian menggunakan desain eksperimen atau acak, tujuh menggunakan desain kuasi-eksperimen atau komparatif, tiga menggunakan metode campuran, dua menggunakan perbandingan longitudinal atau kohort, dan dua menggunakan intervensi satu kelompok. Hasil belajar menjadi aspek yang paling sering diteliti, diikuti motivasi, keterlibatan, perbedaan individu, dan retensi. Poin, papan peringkat, kuis, tantangan, umpan balik, lencana, indikator kemajuan, narasi, dan escape room umumnya digunakan secara bersamaan. Bukti masih terkonsentrasi pada satu mata kuliah, intervensi jangka pendek, dan bidang STEM. Temuan positif cukup banyak, tetapi keragaman intervensi dan pengukuran belum mendukung simpulan kausal yang berlaku umum. Penelitian berikutnya perlu menjelaskan komponen intervensi, menggunakan tes tertunda, memperhatikan mahasiswa berprestasi rendah atau tidak menyukai kompetisi, serta melibatkan beberapa mata kuliah atau perguruan tinggi.
Kata kunci: *gamifikasi, hasil belajar, pendidikan tinggi, scoping review*

1. INTRODUCTION

Gamification is the use of game design elements in activities that are not games [1]. In higher education, these elements include points, badges, leaderboards, levels, challenges, progress indicators, narratives, and immediate feedback. They are commonly added to quizzes, learning management systems, simulations, formative assessment, programming tasks, and collaborative projects. Gamification differs from game-based learning because it modifies a learning activity without necessarily turning the activity into a complete game.

Previous reviews show that gamification can support learning, motivation, and participation, but its effects vary across contexts and designs [2]-[5]. Meta-analyses have reported positive average effects, while also showing substantial differences among studies in intervention length, comparison conditions, learning tasks, and outcome measures [3], [4], [7]. Research on theoretical foundations likewise indicates that points or badges do not produce educational value by themselves, their contribution depends on the motivational and instructional processes they activate [6].

The practical challenge is that the term gamification covers many different interventions. A leaderboard used for weekly quizzes is not equivalent to a narrative-based course, a collaborative escape room, or an adaptive assessment system. Studies also measure different outcomes. Some focus on examination scores, others on quiz completion, satisfaction, emotions, self-efficacy, persistence, or knowledge retention. As a result, a statement that gamification is effective may hide important differences in what was implemented and what was measured.

Recent higher education studies have expanded beyond simple points and rankings. They include challenge-based systems, fantasy narratives, integrity games, adaptive assessment, collaborative activities, and combinations of gamification with flipped learning. However, the field remains dominated by studies conducted in one course or institution, often over a short period. There is also limited information about delayed learning, accessibility, lower-performing students, students who dislike competition, and the workload required to maintain gamified activities.

A scoping review is appropriate when the objective is to map the extent, characteristics, and gaps of a diverse research field rather than calculate one pooled effect. This study therefore examined four questions: (1) What research designs and educational contexts characterize recent gamification studies in higher education? (2) Which gamification elements and intervention formats are used? (3) Which outcomes are measured and what broad patterns are reported? and (4) Which research gaps should guide future studies? The contribution of the review is a structured map of recent empirical research that can support more precise study design and more careful use of gamification in university teaching.

2. METHOD

2.1. Review Design

The study used a scoping review design guided by the JBI approach to scoping reviews [8]. Reporting was informed by the PRISMA Extension for Scoping Reviews (PRISMA-ScR) [9]. The review was intended to map research characteristics, intervention elements, outcome categories, and evidence gaps. It did not estimate a pooled effect and did not treat the frequency of positive findings as proof of effectiveness.

2.2. Eligibility Criteria

Eligibility was structured using population, concept, and context. The population comprised students enrolled in universities or equivalent higher education programmes. The concept was gamification, defined as the use of identifiable game elements in teaching, learning, assessment, or course management. The context was formal higher education. Studies were required to report an empirical outcome related to learning, engagement, motivation, affect, retention, self-regulation, behaviour, or satisfaction.

Table 1. Eligibility Criteria

Dimension	Included	Excluded
Population	Students in universities or equivalent higher education programmes.	School-only populations, workplace training, or general users outside higher education.
Concept	Identifiable game elements used in teaching, learning, assessment, or course management.	Complete educational games without separable gamification elements or rewards unrelated to learning.
Evidence	Peer-reviewed empirical research with extractable educational or learner outcomes.	Editorials, opinion articles, protocols, and conceptual papers without empirical findings.
Period	Studies published from 2019 to 2025.	Publications outside the defined period.
Reporting	Participants, intervention, data collection, and analysis described sufficiently for mapping.	Insufficient or unverifiable methodological information.

2.3. Information Sources and Search Strategy

The documented search covered ERIC, the Directory of Open Access Journals, Crossref-indexed publisher platforms, and backward citation searching. Searches were completed on 23 July 2026 and covered peer-reviewed studies published from January 2019 through December 2025. Search combinations included gamification, gamified learning, higher education, university students, learning outcomes, academic achievement, engagement, motivation, retention, formative assessment, challenge, badge, and leaderboard. The end date was limited to 2025 to avoid treating the incomplete 2026 publication year as a complete evidence period.

2.4. Study Selection

The search record contained 74 publications. After duplicates and records that clearly failed the basic criteria were removed, 52 titles and abstracts were screened. Thirty-four full texts were assessed, and 20 studies met all inclusion criteria. Full-text exclusions concerned duplicate datasets, insufficient methodological reporting, interventions that were better classified as game-based learning, or outcomes that could not be mapped. Figure 1 presents the selection process.

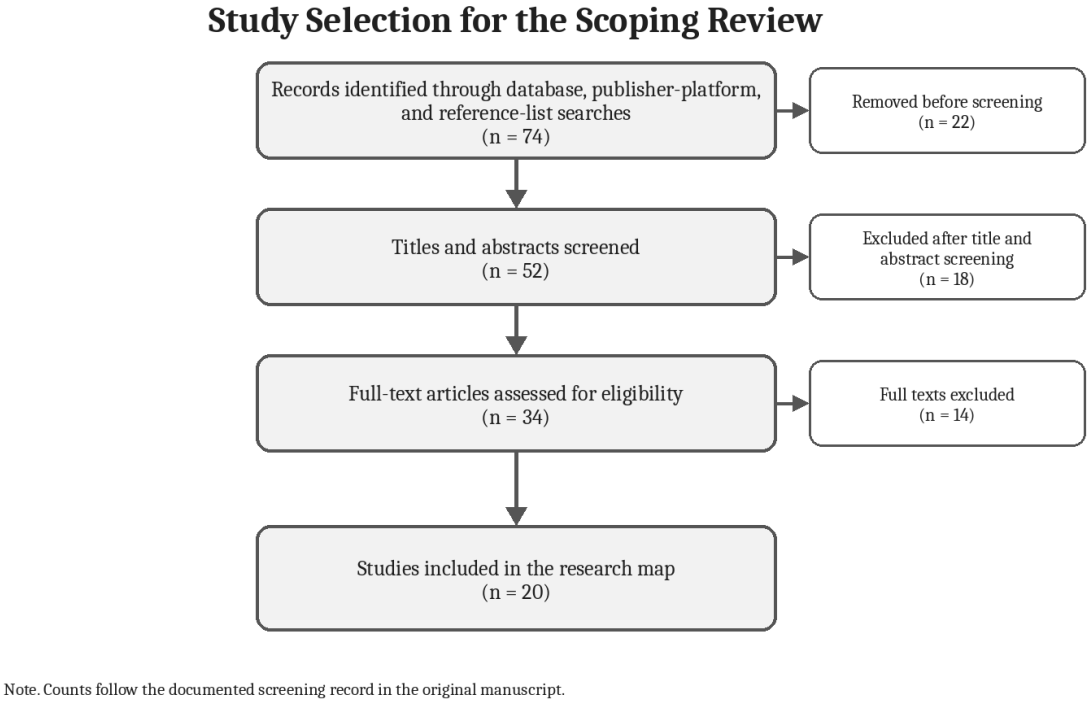


Figure 1. Study Selection Process

2.5. Data Charting and Analysis

A structured charting form recorded author, year, educational field, sample size, research design, intervention duration, gamification elements, comparison condition, measured outcomes, principal findings, and reported limitations. Design categories were assigned according to the main method reported by each study. Outcome categories were not mutually exclusive because one study could measure several outcomes. Data were summarized with descriptive counts and thematic mapping. No meta-analysis was conducted because the interventions, disciplines, durations, and measures were too heterogeneous for meaningful statistical pooling.

2.6. Appraisal and Ethical Considerations

Formal critical appraisal was not used as an exclusion criterion because the purpose was to map the research field rather than determine a single effect estimate. Nevertheless, design limitations, comparison conditions, duration, sample scope, and outcome measurement were recorded and considered in interpretation. The review used published studies and did not involve direct contact with human participants, therefore, new research ethics approval was not required.

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. Characteristics of the Included Studies

The 20 included studies were published between 2019 and 2025. Sample sizes ranged from 23 to 1,001 students, and intervention duration ranged from a single activity to three academic years. The evidence covered computing, engineering, statistics, business, health sciences, languages, academic integrity, and multidisciplinary university courses. However, STEM-related fields and technology-supported formative assessment were especially visible.

Most studies were conducted within one course or one institution. This structure allowed detailed implementation but limited transfer to other disciplines, institutional types, and student populations. Several studies used comparison groups or experimental allocation, while others combined quantitative outcomes with interviews or surveys. Only a small part of the corpus followed students beyond the immediate intervention period.

Table 2. Characteristics of the 20 Included Studies

Study	Context	Primary design	Gamification and mapped outcomes
Orhan Göksün & Gürsoy [10]	University course	Comparative implementation	Kahoot and Quizizz, achievement and engagement
Sanchez et al. [11]	Classroom quizzes	Experiment	Points and competition, short-term learning, lower-performing students
Putz et al. [12]	Secondary and tertiary workshops	Longitudinal study	Multiple elements, knowledge retention
Legaki et al. [13]	Statistics education	Experiment	Challenges, points, levels, leaderboard, learning

Study	Context	Primary design	Gamification and mapped outcomes
Smiderle et al. [14]	Programming course	Four-month intervention	Points, badges, ranking, learning, engagement, personality
Zainuddin et al. [15]	Formative assessment	Comparative intervention	Gamified e-quizzes, learning and engagement
Murillo-Zamorano et al. [16]	Active-learning course	Comparative intervention	Competition, feedback, co-creation, skills and satisfaction
Dugnol-Menéndez et al. [17]	Occupational therapy	Single-group intervention	Collaborative escape room, motivation and immediate learning
Zahedi et al. [18]	Computer science	Mixed methods	Course gamification, performance, gender, and identity
Almufareh [19]	Second-language learning	Comparative intervention	Game elements, vocabulary, motivation, individual differences
Bai et al. [20]	Online learning	Two experiments	Basic elements and fantasy narrative, interaction and learning
Pozo-Sánchez et al. [21]	Higher education escape rooms	Comparative study	Face-to-face and virtual designs, motivation and learning
Lampropoulos & Sidiropoulos [22]	Multi-year course cohorts	Longitudinal comparison	Gamified environment, performance and engagement
Cigdem et al. [23]	Engineering education	Quasi-experiment	Leaderboard quizzes, examination achievement and completion
Zhang & Huang [24]	Blended assessment	Comparative intervention	Adaptive gamified assessment, accuracy and motivation
Goddiksen et al. [25]	Academic integrity	Randomized experiment	Online integrity games, learning and engagement
Garaccione et al. [26]	Business process modelling	Experiment	Rewards, feedback, progression, penalties, learning and productivity
Ortiz-Rojas et al. [27]	Calculus / STEM	Mixed methods	Leaderboard, learning, motivation, and self-efficacy
Perez-Aranda et al. [28]	Collaborative online learning	Comparative study	Gamified collaboration, class and test emotions
Ghafouri et al. [29]	Nursing education	Randomized comparison	Gamification and flipped learning, performance and motivation

3.1.2. Mapping of Research Designs

The research map identified six experimental or randomized studies, seven quasi-experimental or comparative studies, three mixed-methods studies, two longitudinal or cohort comparisons, and two single-group interventions. These categories refer to the principal design used in each publication. The presence of experimental designs strengthened parts of the evidence base, but many studies still relied on convenience samples and course-specific implementation.

The studies differed substantially in the type and intensity of gamification. Some added points and leaderboards to quizzes, while others redesigned an entire sequence of learning activities with challenges, feedback, progression, collaboration, narrative, or adaptive difficulty. Consequently, studies using the same label did not necessarily test the same instructional approach.

Table 3. Distribution of Primary Research Designs

Design category	n	Description
Experimental or randomized	6	Controlled tests of gamified quizzes, challenge systems, narratives, integrity games, modelling tasks, or flipped learning.
Quasi-experimental or comparative	7	Comparisons between platforms, cohorts, gamified and non-gamified activities, or different delivery formats.
Mixed methods	3	Combined performance data with interviews, surveys, or qualitative interpretation.
Longitudinal or cohort comparison	2	Repeated or multi-year comparisons that examined change beyond a single activity.
Single-group intervention	2	Pre-post or implementation studies without a parallel control group.

3.1.3. Gamification Elements

Points, scores, leaderboards, quizzes, challenges, levels, badges, feedback, and progress indicators were the most common elements. Narrative and escape-room formats appeared less often but represented more extensive redesign. Most studies combined several elements, making it difficult to identify which component contributed to a reported change. Immediate feedback and repeated opportunities to practise were frequently present in studies that reported learning gains [11], [13], [15], [23].

Competition was commonly implemented through rankings or leaderboards. It sometimes increased participation or performance, but benefits were not evenly distributed. Sanchez et al. reported limited benefit for lower-performing students [11], while personality, gender, prior experience, and motivational response qualified findings in other studies [14], [18], [19], [27]. These results show why a gamification intervention should be described as a set of design decisions rather than a single treatment.

3.1.4. Mapping of Outcomes

Learning performance was mapped in 18 studies, making it the most frequent outcome category. Motivation or affect appeared in 12 studies, behavioural engagement in 11, equity or individual differences in six, and retention or self-regulation in four. The categories overlapped because many studies assessed several outcomes. Positive findings were common, but they were not consistent across all indicators or student groups.

Short-term task performance was more frequently measured than durable understanding. Some studies found improvements in quiz scores, problem solving, task accuracy, or course achievement [10], [13], [15], [23], [26], [27], [29]. However, engagement was often represented by activity counts such as attempts or completed quizzes. These measures indicate participation but do not establish depth of learning. Longitudinal and delayed evidence remained limited, although Putz et al. and Lampropoulos and Sidiropoulos provided examples of research extending beyond a brief intervention [12], [22].

Table 4. Outcome Categories in the Included Studies

Outcome category	n	Examples of measures
Learning performance	18	Scores, achievement, task accuracy, knowledge, skills, or course performance.
Motivation or affect	12	Motivation, enjoyment, satisfaction, emotions, interest, or self-efficacy.
Behavioural engagement	11	Participation, quiz completion, attempts, interaction, attendance, or activity.
Equity or individual differences	6	Prior achievement, gender, personality, competition preference, or differential benefit.
Retention or self-regulation	4	Delayed knowledge, persistence, progress monitoring, or continued participation.

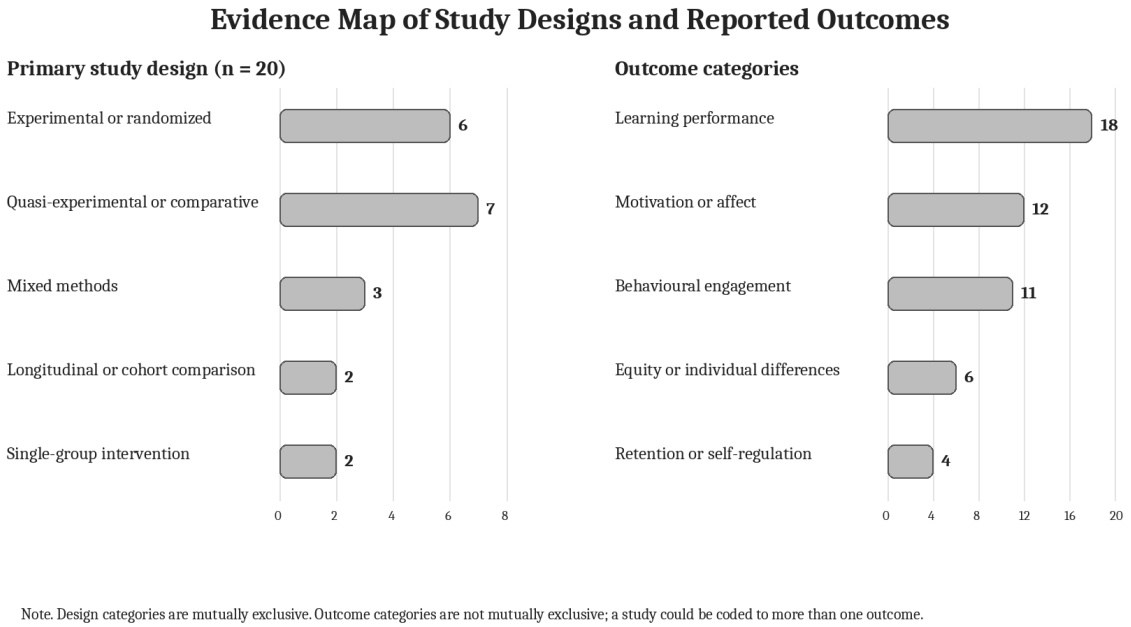


Figure 2. Evidence Map of Study Designs and Reported Outcomes

3.1.5. Research Gaps

The map identified recurring gaps in duration, institutional scope, learner diversity, intervention reporting, outcome selection, adverse findings, and implementation sustainability. Table 5 summarizes the principal gaps and their implications for future research.

Table 5. Research Gaps and Recommended Directions

Area	Current pattern	Recommended direction
Duration and retention	Most studies examined one activity or one course period.	Use delayed tests and follow-up measures after the gamified activity ends.
Institutional scope	Single-course and single-institution studies dominated.	Use multi-course and multi-institutional designs and report context clearly.
Learner diversity	Lower-performing, competition-averse, disabled, and low-access students received limited attention.	Report subgroup outcomes and provide non-competitive or accessible participation routes.
Intervention description	Game elements, rules, duration, and implementation quality were not always described in enough detail.	Report each element, its instructional purpose, exposure, and implementation changes.
Outcome balance	Engagement and satisfaction were measured more often than durable understanding or transfer.	Separate activity from learning and include conceptual, transfer, and retention outcomes.
Null and adverse findings	Positive findings were more visible than null or negative results.	Report novelty decline, pressure, disengagement, and implementation failure.
Workload and governance	Instructor workload, platform data, privacy, and maintenance received little analysis.	Measure preparation time, technical support, data use, and sustainability.

3.2. Discussion

3.2.1. Interpretation of the Research Map

The scoping review shows that recent higher education gamification research is methodologically more varied than a simple collection of satisfaction studies. Experimental, comparative, mixed-methods, and longitudinal designs are present. Nevertheless, the field remains fragmented because interventions use different combinations of game elements, operate for different lengths of time, and measure different outcomes. The map therefore supports a cautious conclusion:

gamification can organize useful learning behaviours, but the available studies do not justify one general claim that every gamified design improves learning.

The more credible positive pattern concerns the alignment between game elements and instructional activity. Challenges can structure practice, feedback can correct error, progress indicators can support monitoring, and repeated attempts can increase opportunities to learn. In contrast, points or rankings that are not connected to explanation, feedback, revision, or meaningful tasks may increase activity without improving understanding. This interpretation is consistent with previous meta-analyses and theoretical reviews [3], [4], [6], [7].

Engagement should not be treated as a substitute for learning. More logins, attempts, or completed quizzes may be valuable when they lead to practice and feedback, but they may also reflect novelty, external pressure, or score seeking. Studies that measured several outcomes showed that learning, motivation, satisfaction, and productivity did not always move in the same direction [11], [17], [26], [27]. Research reports should therefore distinguish behavioural engagement from cognitive engagement and academic performance.

3.2.2. Competition and Learner Diversity

Competition requires particular care. Public rankings may help some students set goals, yet repeated low positions can discourage others. Alternatives include personal progress, anonymous ranking bands, small-group challenges, optional competition, and recognition of improvement. These options maintain goal clarity without making public comparison the only route to success. Studies should also report outcomes for students with different prior achievement, personality, gender, gaming experience, accessibility needs, and preference for competition.

3.2.3. Implications for Research Design

For research design, future studies should report the intervention in sufficient detail to permit replication. At minimum, authors should identify the game elements, instructional purpose, rules, duration, frequency of exposure, comparison condition, teacher role, platform, and changes made during implementation. Stronger studies should add pre-intervention measures, delayed assessments, implementation checks, subgroup analysis, and multi-course or multi-institutional sampling. Null and negative results should be reported because novelty decline, pressure, confusion, and unequal participation are relevant educational outcomes.

3.2.4. Implications for Teaching and Institutional Practice

For teaching practice, instructors should begin with a learning problem rather than a platform feature. Low participation may justify low-stakes challenges and visible progress, while misconceptions require explanatory feedback and revision. Weak transfer requires authentic tasks and reflection rather than faster score accumulation. Institutions can support responsible use through instructional-design assistance, accessibility review, data-protection rules, and realistic planning for instructor workload. Evaluation should include learning quality, participation, equity, and sustainability.

3.2.5. Limitations

This review has four limitations. First, the search covered selected databases and publisher platforms and may have missed studies indexed elsewhere. Second, only English-language publications from 2019-2025 were included. Third, formal critical appraisal was not used to exclude studies, so the map describes the field but does not rank the certainty of every finding. Fourth, outcome coding depended on the information reported in the publications and may not capture measures that were insufficiently described. Publication bias may also make positive studies more visible.

4. CONCLUSION

This scoping review mapped 20 empirical studies of gamification in higher education published from 2019 to 2025. The research included experimental, quasi-experimental, comparative, mixed-methods, longitudinal, and single-group designs. Learning performance was the most frequently measured outcome, followed by motivation, engagement, individual differences, and retention. Most interventions combined points, rankings, quizzes, challenges, feedback, progress indicators, badges, narratives, or collaborative activities.

The principal finding is that gamification is not one uniform intervention. Its educational value depends on the connection between game elements, learning objectives, task design, feedback, duration, and learner characteristics. Current evidence is strongest for short-term learning and participation within single courses, while delayed learning, transfer, equity, accessibility, institutional scale, and sustainability remain less studied. Future research should describe interventions clearly, use stronger comparison and follow-up designs, report null and adverse findings, and examine diverse groups of students. Universities should evaluate gamification through learning quality and fair participation rather than activity counts alone.

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