

Game-Based Learning Innovations in Physical Education: A Literature Review

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Abstract. *Game-Based Learning (GBL) is an increasingly developing learning innovation in physical education; however, research on its implementation remains scattered across various contexts, research designs, and forms of innovation, thus not yet providing a comprehensive overview of the field's development. This study aims to analyze the development of Game-Based Learning innovations in physical education through a literature review of research published between 2022 and 2026. The study utilized the Narrative Literature Review method by analyzing 25 scientific articles selected based on inclusion and exclusion criteria. Data were analyzed using thematic analysis to identify research characteristics, main themes, and the direction of research development. The review results indicate that GBL innovations have evolved from conventional games toward gamification, Teaching Games for Understanding (TGfU), exergames, digital games, and technology-based learning. Research themes are dominated by learning motivation, student engagement, learning outcomes, motor skills, physical fitness, and social interaction. This study concludes that GBL has strong potential to support more innovative and student-centered physical education learning and provides an overview of research trends and developmental opportunities that can serve as a reference for future research and learning practices.*

Keywords: *Game-Based Learning, Learning Innovations, Physical Education,*

INTRODUCTION

Physical education is an integral part of the educational system that plays a role in developing students holistically through physical activity-based learning experiences. In addition to aiming to improve physical fitness and motor skill mastery, physical education also contributes to cognitive, affective, and social development, as well as character building through active, collaborative, and reflective learning experiences (Kirk, 2019; Rink, 2020). In the context of 21st-century education, physical education learning is no longer solely oriented toward motor skill mastery, but is also directed at building critical

thinking, problem-solving, communication, and collaboration skills as competencies needed by students to face social changes and technological developments (UNESCO, 2015). Therefore, physical education teachers are required to be able to design innovative, meaningful, and student-centered learning experiences so that learning objectives can be achieved optimally.

The development of digital technology and the demands of 21st-century competencies have driven the transformation of learning approaches in various fields of education, including physical education. Learning is no longer only oriented toward motor skill mastery, but is also directed at creating active, collaborative, and student-centered learning experiences, thereby improving motivation, engagement, and the quality of the learning process (Rink, 2020). These conditions demand physical education teachers to apply learning strategies that are more innovative and adaptive to student characteristics. One approach that has developed in recent years is Game-Based Learning (GBL), which is a learning approach that integrates game elements into the learning process to create more meaningful and engaging learning experiences (Camacho-Sánchez, Manzano-León, , José Miguel Rodríguez-Ferrer, et al., 2023; Mercan & Varol Selçuk, 2024).

During the 2022–2026 period, Game-Based Learning (GBL) has gained increasing attention as an innovative learning approach in physical education because it is considered capable of connecting play activities with learning objectives more meaningfully. A number of studies indicate that GBL has been used across various educational levels and in diverse learning contexts, including mobile application-based learning, high school students' learning experiences, and the application of game strategies in physical education learning (Camacho-Sánchez, Manzano-León, , José Miguel Rodríguez-Ferrer, et al., 2023; Culajara, 2022; Ezeddine et al., 2025). This development shows that GBL is no longer viewed merely as a play activity, but rather as a pedagogical approach that supports active, enjoyable, and student-centered learning.

Synthesis of various studies shows that the implementation of Game-Based Learning in physical education generally provides positive impacts on various aspects of learning. Most studies report increased learning motivation, student engagement, and learning experience quality as an impact of implementing structured game activities.

Furthermore, these studies also demonstrate GBL's contribution to improving learning outcomes, motor skill mastery, as well as social interaction and cooperation during the learning process (Camacho-Sánchez, Manzano-León, , José Miguel Rodríguez-Ferrer, et al., 2023; Ezeddine et al., 2025). Along with technological advancements, several recent studies have also begun utilizing digital media to enrich learning experiences, so that the focus of GBL studies is no longer limited to improving learning performance, but is also heading toward the development of more adaptive and innovative learning environments (Culajara, 2022; Ezeddine et al., 2025).

Nevertheless, when synthesized from the reviewed articles, the study of Game-Based Learning in physical education still tends to focus on testing intervention effectiveness within specific contexts with relatively limited samples, meaning the resulting findings do not yet fully capture the development of this field as a whole. Several studies also still indicate the need for further research to understand students' needs and challenges when learning through GBL, as well as to assess the long-term impact of its implementation in physical education (Camacho-Sánchez, Manzano-León, Rodríguez-Ferrer, et al., 2023). Thus, room remains open for studies that not only summarize research findings, but also integrate findings, map publication trends, identify dominant themes, and formulate the direction of GBL development for the 2022–2026 period.

Based on this gap, this study aims to examine Game-Based Learning innovations in physical education through a literature review approach on publications from 2022–2026. This study is directed at mapping research trends, identifying dominant themes, synthesizing empirical findings, and formulating future research directions for Game-Based Learning. The results of this study are expected to provide theoretical contributions in enriching the literature of physical education while serving as a practical basis for teachers and researchers in developing more active, enjoyable, and student-centered learning.

METHODS

This study uses the Narrative Literature Review (NLR) method to identify, analyze, and synthesize research findings regarding the implementation of Game-Based Learning (GBL) in physical education learning. This approach was selected because it can provide

a comprehensive understanding of a topic's development through a critical synthesis of various published studies (Ferrari, 2015). To maintain the quality of the review preparation, this study refers to the principles of the Scale for the Assessment of Narrative Review Articles (SANRA), which emphasizes transparency in the literature search process, article selection, and presentation of research synthesis (Baethge et al., 2019).

The literature search was conducted in July 2026 through two scientific databases, namely Google Scholar and the Directory of Open Access Journals (DOAJ). The search process utilized a combination of keywords: "Game-Based Learning", "Gamification", "Exergames", "Teaching Games for Understanding (TGfU)", "Physical Education", and "Pendidikan Jasmani", assisted by the Boolean operators AND and OR to obtain articles matching the research focus.

Articles included in this study had to meet the following inclusion criteria: (1) published in the 2022–2026 period; (2) peer-reviewed scientific journal articles; (3) available in full-text format; (4) written in Indonesian or English; and (5) discussing the application, development, or evaluation of Game-Based Learning, gamification, exergames, or other game-based learning approaches in physical education. Meanwhile, articles in the form of proceedings, books, undergraduate theses, master's theses, dissertations, editorials, and articles not directly related to the research topic were excluded from the review process.

A total of 25 articles that met the inclusion criteria were subsequently analyzed using thematic analysis. Data extracted from each article included the author's name, publication year, country of origin, research design, educational level or participant characteristics, type of Game-Based Learning innovation, research focus, and main findings. Furthermore, the data were grouped based on theme similarities to identify research trends, Game-Based Learning implementation characteristics, and the direction of research development in the field of physical education during the 2022–2026 period. The synthesis results are presented descriptively and narratively to provide a comprehensive overview of research development on the topic.

Table 1. Summary of the Research Procedure

Component	Description
Research design	Narrative Literature Review (NLR)
Databases	Google Scholar and DOAJ
Publication period	2022–2026
Article language	Indonesian and English
Number of articles analyzed	25 articles
Data analysis technique	Thematic analysis

RESULT AND DISCUSSION

Result

Table 2. Characteristics of the Reviewed Articles

No	Author (Year)	Country	Research Design	Participants	Type of GBL Innovation	Main Focus	Main Findings
1	Culajara (2022)	Philippines	Phenomenological	University students	<i>Game-Based Learning</i>	Learning experiences	GBL improved students' engagement and learning experiences in physical education.
2	Arufe-Giráldez et al. (2022)	Spain	Systematic Review	32 reviewed studies	Gamification	Motivation & learning outcomes	Gamification positively affected motivation, participation, and learning outcomes.
3	Camacho-Sánchez et al. (2023)	Spain	Systematic Review	Reviewed studies	GBL & Gamification	Learning effectiveness	GBL enhanced motivation, engagement, and active learning.
4	Merino-Campos et al. (2023)	Spain	Quantitative	Students	Educational Video Games	Technology acceptance	Acceptance depended on perceived usefulness and enjoyment.
5	Röglin et al. (2023)	Germany	Intervention Study	School students	Exergaming	Enjoyment	Exergaming increased enjoyment during PE.
6	Rahmawati & Ridwan (2024)	Indonesia	Experimental	Secondary students	<i>Game-Based Learning</i>	Learning motivation	Students' motivation increased significantly.
7	Purwanto et al. (2024)	Indonesia	Experimental	Elementary students	Game-Based Physical Learning	Gross motor skills	Improved students' gross motor skills.
8	Mahardhi et al. (2024)	Indonesia	Experimental	University students	Game-Based Instruction	Engagement	Improved engagement and game performance.
9	Marsigliante et al. (2024)	Italy	Intervention Study	Children	Exergames	Physical fitness	Increased fitness, enjoyment, and body composition.
10	Mo et al. (2024)	China	Systematic Review &	Children & adolescents	Game-Based PE	Enjoyment	Increased enjoyment in PE learning.

			Meta-analysis				
11	Yan et al. (2024)	China	Randomized Controlled Trial	Primary students	Basketball <i>Game-Based Learning</i>	Basketball learning	Improved learning outcomes and engagement.
12	Zhao et al. (2024)	China	Meta-analysis	School students	AI-supported Exergames	Learning outcomes	Positive effects on PE achievement.
13	Mercan & Varol Selçuk (2024)	Türkiye	Systematic Review	Reviewed studies	GBL & Gamification	Motivation & outcomes	Positive impact on motivation and learning outcomes.
14	Romadho et al. (2024)	Indonesia	Experimental	School students	TGfU	Motivation	Increased motivation and academic learning time.
15	Dese et al. (2025)	Indonesia	Quasi-experimental	Elementary students	<i>Game-Based Learning</i>	Motor skills & motivation	Improved motivation and fundamental motor skills.
16	Ezeddine et al. (2025)	Tunisia	Literature Review	Reviewed studies	Game-Based Physical Education	Motivation & achievement	Increased motivation and learning outcomes.
17	Tetikay (2025)	Indonesia	Experimental	Elementary students	<i>Game-Based Learning</i>	Physical fitness	Improved physical fitness and motivation.
18	Salsa Nabila Wardhani et al. (2025)	Indonesia	Experimental	Junior high students	<i>Game-Based Learning</i>	Social interaction	Improved social interaction and physical fitness.
19	Wiyarko & Adhi (2025)	Indonesia	Experimental	Primary students	<i>Game-Based Learning</i>	Learning outcomes	Improved PE learning outcomes.
20	Añasco & Olimpo (2025)	Philippines	Experimental	PE students	Gamification	Academic performance	Improved engagement and academic performance.
21	Usiku & Mohamad Yatim (2025)	Malaysia	Survey Review	Review articles	Exergames	GBL trends	Exergames show strong potential in PE.
22	Sotoca-Orgaz et al. (2025)	Spain	Experimental	School students	Mobile Exergames	Active learning	Mobile exergames promoted active participation and healthy lifestyles.
23	Yan et al. (2023)	Australia	Systematic Review	Primary school studies	Game-Based Approaches	Evidence synthesis	Game-based approaches consistently improved motivation, engagement, and movement competence.
24	Mas'odi et al. (2026)	Indonesia	Bibliometric Analysis	Indonesian publications	<i>Game-Based Learning</i>	Research trends	Identified publication trends and future research directions.
25	Wijaya & Fitri (2023)	Indonesia	Experimental	School students	Traditional Game-based e-Learning	Locomotor skills	Improved students' basic locomotor movement skills.

Based on Table 2, a total of 25 articles were analyzed in this review. These articles originate from various countries, with the largest contribution from Indonesia, followed by Spain and China, while other studies come from the Philippines, Germany, Italy, Turkey, Tunisia, Malaysia, and Australia. In terms of research design, the most widely used are experiments, followed by systematic reviews, intervention studies, as well as several other approaches such as quantitative, randomized controlled trials, meta-analyses, bibliometric analyses, and phenomenological studies. This diversity shows that studies on Game-Based Learning in physical education have developed through broad methodological approaches and are no longer limited to a single research form.

In terms of learning innovations, the analyzed articles show that the forms of game-based applications are quite diverse, ranging from Game-Based Learning, gamification, exergames, Game-Based Physical Learning, Game-Based Instruction, TGfU, mobile exergames, to traditional game-based e-learning. This variation indicates that game-based terms and practices in physical education do not stand alone, but intersect in an effort to improve learning quality, student engagement, learning outcomes, motor skills, and more active learning experiences.

General Trends of Research Findings

In general, the research findings in this corpus show a consistent tendency in several main themes. The most frequently emerging themes relate to learning motivation, student engagement, learning outcomes, motor skills, enjoyment, physical fitness, and social interaction. In addition, several studies have also begun to highlight technology acceptance, the use of educational video games, and the direction of research development through bibliometric analyses and systematic reviews. This pattern shows that Game-Based Learning in physical education is not only understood as a fun learning strategy but also as an approach relevant to students' physical, cognitive, and social achievements.

Looking further, empirical studies in this corpus tend to report positive results regarding the implementation of game-based approaches, whether in the context of elementary school, middle school, or higher education learning. Meanwhile, synthesis studies such as systematic reviews, meta-analyses, and bibliometric analyses reinforce

that research interest in Game-Based Learning in physical education continues to grow and is beginning to head toward theme grouping, trend identification, and mapping future development directions.

Research Characteristics by Country, Educational Level, and Design

Based on the article characteristics table, research on Game-Based Learning in physical education is spread across various countries and educational levels. This study's corpus shows the involvement of studies from Indonesia, Spain, China, the Philippines, Germany, Italy, Turkey, Tunisia, Malaysia, and Australia, illustrating that this topic has become a concern across educational and cultural contexts. In terms of level, research is mostly directed at elementary and middle school students, but also includes university students in the context of higher education learning. This contextual diversity shows that GBL is not only relevant to one specific educational phase but can be applied at various learning levels according to student characteristics.

In terms of research design, the analyzed studies are dominated by experimental and quasi-experimental approaches, followed by systematic reviews, meta-analyses, intervention studies, randomized controlled trials, phenomenological studies, and bibliometric analyses. This pattern indicates that GBL studies in physical education are moving from direct effectiveness testing toward broader and more reflective evidence mapping. Thus, the development of the analyzed literature not only confirms the benefits of GBL in learning practices but also shows that this field is beginning to be read as an increasingly methodologically mature area of study.

Dominant Research Themes

The synthesis of the 25 articles shows that the most prominent theme in GBL research in physical education relates to learning motivation and student engagement. This theme appears repeatedly in studies discussing student learning experiences, educational video game acceptance, the effectiveness of GBL on motivation, and the use of game-based approaches in physical education learning. The dominance of this theme confirms that the main appeal of GBL lies in its ability to create a more active and engaging learning atmosphere that encourages student participation.

The next theme that also strongly emerges is learning outcomes, motor skills, and mastery of basic movements. A number of studies report that game-based approaches can help improve gross motor skills, locomotor abilities, game performance, and academic achievement in physical education. These results indicate that GBL not only impacts affective aspects but also contributes to students' psychomotor and cognitive aspects.

In addition, themes of enjoyment, physical fitness, social interaction, and technology acceptance also appear as important focuses in this corpus. Studies on exergames, mobile exergames, and video game-based learning show that GBL has the potential to support enjoyable learning experiences while simultaneously encouraging more meaningful physical activity. At the same time, studies based on reviews, meta-analyses, and bibliometric analyses show that GBL is beginning to be mapped not only as a learning strategy but also as a field of study that continues to develop and has an increasingly clear development direction.

Discussion

The Development of Game-Based Learning Innovations in Physical Education

The synthesis results indicate that Game-Based Learning (GBL) innovations in physical education experienced significant development during the 2022–2026 period. At the beginning of the study period, GBL implementation was still dominated by the use of games as a strategy to improve students' motivation and learning experiences. As research progressed, these innovations were no longer limited to conventional games but began to integrate various approaches such as gamification, Teaching Games for Understanding (TGfU), exergames, digital games, and the use of mobile technology (mobile exergames). This development shows that GBL has evolved from a mere activity-based learning method into a pedagogical approach that combines physical activity, technology, and more interactive learning experiences (Arufe-Giráldez et al., 2022; Camacho-Sánchez, Manzano-León, , José Miguel Rodríguez-Ferrer, et al., 2023; Mercan & Varol Selçuk, 2024).

This change also reflects a shift in research focus from merely testing learning effectiveness toward developing innovations capable of meeting 21st-century educational needs. Various studies show that the integration of technology, such as exergames and

educational video games, is able to create more adaptive learning experiences, increase student participation, and strengthen the connection between physical activity and the learning process. Thus, GBL innovation is not only viewed as a medium to improve learning outcomes but also as an approach that supports more contextual, collaborative, and student-centered learning (Marsigliante et al., 2024; Merino-Campos et al., 2023; Zhao et al., 2024).

Synthesis of Research Findings

The synthesis of the analyzed articles shows that learning motivation and student engagement are the two most dominant themes in GBL research. These findings indicate that game elements can create a more enjoyable learning atmosphere, encouraging students to actively participate in the physical education learning process. This condition aligns with Self-Determination theory, which explains that a learning environment providing enjoyable experiences, a sense of belonging, and opportunities to demonstrate competence will increase students' intrinsic motivation. Therefore, GBL functions not only as a variation of learning methods but also as a strategy capable of improving the quality of students' learning experiences (Ezeddine et al., 2025; Rahmawati & Ridwan, 2024).

In addition to increasing motivation, most studies also report that GBL contributes to the improvement of students' learning outcomes, motor skills, physical fitness, and social interactions. This indicates that GBL implementation has a multidimensional impact because it not only develops psychomotor abilities but also supports the development of cognitive, affective, and social aspects. Nevertheless, the characteristics of the interventions used in each study are still highly varied, whether in terms of duration, type of game, or student characteristics. This variation indicates that GBL's effectiveness is still influenced by the implementation context, so research results need to be understood comprehensively, rather than as a universal cause-and-effect relationship (Mahardhika et al., 2024; Mo et al., 2024; Purwanto et al., 2024).

Implications and Directions for Future Research

The findings in this study imply that the implementation of GBL has great potential to support the transformation of physical education learning to be more innovative and

student-centered. For educational practitioners, these synthesis results indicate that the use of games, whether in the form of traditional games or digital technology-based ones, can be an alternative learning strategy capable of improving the quality of the learning process. However, the selection of the GBL form still needs to be adjusted to the learning objectives, student characteristics, availability of facilities, and teacher competencies so that its implementation runs optimally.

On the other hand, this study also identifies several research opportunities that remain open. Most studies are still dominated by experimental designs with short-term measurements, so evidence regarding the sustainability of GBL's impact remains relatively limited. In addition, research on the integration of artificial intelligence, virtual reality, augmented reality, and wearable technology in physical education learning is still rarely found in the analyzed research corpus. Therefore, future research needs to develop longitudinal designs, mixed-methods approaches, and the exploration of more diverse technological innovations to provide a more comprehensive understanding of the effectiveness and sustainability of GBL implementation in physical education (Mas'odi et al., 2026; Mercan & Varol Selçuk, 2024).

CONCLUSION

This literature review shows that research on Game-Based Learning (GBL) in physical education experienced fairly rapid development during the 2022–2026 period, in terms of publication volume, variety of learning approaches, and research scope. Based on the synthesis of 25 articles, GBL innovations have developed from the use of conventional games toward more diverse approaches, such as gamification, Teaching Games for Understanding (TGfU), exergames, digital games, and technology-based learning. This development indicates that GBL is no longer seen merely as an alternative learning method, but has become a pedagogical approach supporting more active, interactive, and student-centered physical education learning.

The review results also show that research themes are dominated by learning motivation, student engagement, learning outcomes, motor skills, physical fitness, and social interaction. Although most studies report positive impacts of GBL application, this review found that existing research is still dominated by short-term experimental designs

and focuses on testing implementation effectiveness. Therefore, future research needs to develop more comprehensive studies through longitudinal designs, mixed-methods approaches, and the exploration of technology-based innovations, such as artificial intelligence, virtual reality, and augmented reality, to broaden the understanding of GBL implementation in physical education.

Overall, this study contributes by synthesizing the development of Game-Based Learning innovations in physical education during the 2022–2026 period, while also identifying research theme trends and future development opportunities. These findings are expected to serve as a reference for researchers, educators, and curriculum developers in designing physical education learning that is more innovative, adaptive, and suited to students' needs in the digital education era.

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