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Game based learning to support the implementation of deep learning in elementary school physical education: a systematic literature review

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Abstract

Physical Education, Sports, and Health (PESH) learning in elementary schools requires instructional approaches that promote meaningful learning, active engagement, and higher-order thinking skills. Game-Based Learning (GBL) offers potential to support these objectives; however, systematic evidence regarding its contribution to deep learning in elementary school physical education remains limited. This study aimed to identify research characteristics and publication trends and synthesize empirical evidence on the contribution of GBL to deep learning implementation in elementary school physical education. A Systematic Literature Review (SLR) was conducted following the PRISMA 2020 guidelines. Literature searches were performed in Scopus, Google Scholar, and Garuda for studies published between 2020 and 2026. After applying predefined inclusion and exclusion criteria, ten studies were selected for analysis. The findings indicate that GBL supports student engagement, learning motivation, critical thinking, decision-making, creativity, collaboration, and fundamental movement skill development. The synthesis also reveals conceptual alignment between GBL characteristics, including exploration, problem-solving, reflection, collaboration, and contextual learning experiences, and the three dimensions of deep learning: mindful, meaningful, and joyful learning. These findings suggest that GBL is a promising pedagogical approach for supporting deep learning in elementary school physical education. Nevertheless, the strength of this conclusion depends on the methodological quality and empirical evidence of the included studies. Further research using rigorous experimental designs is needed to establish its effectiveness and clarify its contribution to deep learning outcomes.

Keywords: Game Based Learning, Deep Learning, Physical Education, Elementary School; Systematic Literature Review.

INTRODUCTION

Physical Education, Sports, and Health (PESH) in elementary schools plays a strategic and essential role, not only in promoting students' physical fitness but also in serving as a foundation for the holistic development of their motor, cognitive, affective, and character competencies (Wee & Dillon, 2022). However, the decline in physical activity resulting from the increasing intensity of digital device use among elementary school children has become a significant challenge for the education sector. According to a study conducted by (Youn et al., 2020), Low levels of physical activity during early childhood have adverse effects on children's emotional regulation and physical fitness. This condition requires Physical Education, Sports, and Health (PESH) in elementary schools to transform its instructional practices to remain relevant and engaging for the digital generation. To address the challenges of the twenty first century, the orientation of modern education must shift from the mere transmission of knowledge (surface learning) toward fostering critical thinking, collaboration, creativity, and problem-solving skills.

Recently, deep learning has emerged as a prominent concept in the field of education, particularly within the national education system (Angga & Sari, 2025). Although deep learning has recently gained considerable attention, its underlying pedagogical principles are not new. This approach has long been advocated as a means of developing learners who can adapt to the evolving demands of society. The renewed interest in deep learning is rooted in the global need to address challenges within education systems, where students have become increasingly disengaged from traditional instructional approaches, while educators face difficulties due to the limited relevance of conventional teaching methods to contemporary learning needs (Kim et al., 2019). Conventional Physical Education, Sports, and Health

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instruction is often characterized by repetitive, rigid, and monotonous movement activities that provide limited opportunities for meaningful learning. This reflects a broader global trend in which many education systems continue to rely on conventional instructional approaches that are no longer aligned with the contextual demands of contemporary society (McDiarmid & Zhao, 2023).

In Indonesia, the growing interest in deep learning within the implementation of the Merdeka Curriculum has often led to confusion and misconceptions among educational practitioners. Deep learning is frequently misunderstood as a new curriculum, the mere integration of advanced technologies, or an unstructured form of classroom exploration. From a theoretical perspective, however, deep learning is a pedagogical approach that emphasizes meaningful and contextual learning, enabling students to achieve learning outcomes that are retained and transferred over time (Vermunt et al., 2023). The essence of deep learning in children lies in creating physical learning experiences that are mindful, meaningful, and joyful. Therefore, a comprehensive understanding of this pedagogical approach is essential to ensure that deep learning is accurately interpreted and effectively implemented, particularly in the context of Physical Education, Sports, and Health.

As an integral component of the education system, Physical Education, Sports, and Health (PESH) aims to promote the holistic development of students by enhancing physical fitness, motor skills, mental well being, and social values through structured physical activities. The scope of PESH extends far beyond physical exercise, encompassing meaningful learning about healthy lifestyles, social development, and lifelong character building (Yang et al., 2024). These inherent strengths position Physical Education, Sports, and Health (PESH) as a subject with considerable potential for the integration of a deep learning approach. When students actively engage in meaningful physical learning experiences, they not only learn how to perform a movement but also develop a conceptual understanding of why the movement is performed and are able to reflect on and apply this understanding in real life situations.

However, implementing deep learning at the elementary school level presents unique psychological and developmental challenges, as children at this stage are in the concrete operational phase and require concrete, active, and meaningful learning experiences. According to the theoretical perspective proposed by (Metzler, 2021), meeting children's basic psychological need for movement autonomy requires practical and experience based instructional strategies rather than purely theoretical approaches. Such strategies are essential to ensure that deep learning becomes an achievable pedagogical practice rather than merely an abstract concept for Physical Education, Sports, and Health (PESH) teachers. One of the instructional approaches considered most closely aligned with these requirements is Game Based Learning (GBL). Through game based activities, including modified sports such as Teaching Games for Understanding (TGFU) and traditional games, students are naturally encouraged to engage in exploration, problem solving, and reflective thinking.

Empirical evidence has demonstrated that Game Based Learning effectively supports the achievement of deep learning outcomes across both the physical and cognitive social domains of child development. Game Based Learning has been shown to significantly improve elementary school students' mastery of fundamental movement skills. Furthermore, from the perspective of higher order thinking, modified team based games effectively foster conceptual understanding, critical thinking, tactical decision making, rapid decision making, and collaborative problem solving. Through role exchange, strategic planning, and interactive gameplay, Game Based Learning naturally promotes the core dimensions of deep learning, which have often been difficult to achieve through conventional instructional approaches.

Despite the promising conceptual overlap and growing empirical evidence linking Game Based Learning and deep learning in elementary school Physical Education, comprehensive literature syntheses examining the relationship between these two constructs remain limited. Most studies on Game Based Learning at the elementary school level have evaluated its effectiveness in isolation, primarily focusing on physical fitness or learning motivation, without comprehensively examining how game based instructional models foster metacognitive skills, higher order reasoning, and the transfer of learning. To address this research gap, the present study employs a Systematic Literature Review (SLR) based on the PRISMA 2020 guidelines. This review aims to identify and synthesize the characteristics, publication trends, and empirical evidence regarding the effectiveness of Game Based Learning in supporting the implementation of deep learning in elementary school Physical Education between 2020 and 2026. The findings are expected to provide a comprehensive theoretical foundation and practical evidence to inform the design and implementation of deep learning oriented Physical Education instruction.

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METHOD

This study employed a Systematic Literature Review (SLR**)** as its research approach. The review was conducted through two main stages: the systematic identification of relevant journal articles and the subsequent review and synthesis of the selected studies based on predefined procedures. To ensure methodological rigor and transparency, the review process was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) guidelines. The PRISMA framework provides an evidence based reporting guideline and flow diagram designed to support researchers in conducting and reporting systematic literature reviews in a comprehensive, transparent, and reproducible manner (Pati & Lorusso, 2018). In conducting a Systematic Literature Review, researchers must maintain a strong commitment to critical evaluation, as it is essential for ensuring the credibility and trustworthiness of the review findings. Accordingly, this study established a structured study selection process by defining explicit inclusion and exclusion criteria (Triandini et al., 2019). Operationally, the PRISMA based systematic review provides three key methodological advantages: (1) formulating research questions in a clear and systematic manner, (2) establishing objective inclusion and exclusion criteria for study selection, and (3) defining the scope of scientific literature databases and the publication time frame included in the review.

The literature search was conducted using the Google Scholar electronic database. This platform was selected because of its effectiveness in enabling researchers to identify relevant journal publications efficiently and comprehensively through an integrated search and retrieval process.

Table 1. Literature Search Process Used for Data Collection

Data Collection	Search Keywords
Google Scholar	allintitle**:** ("deep learning" OR "meaningful learning") AND ("game based learning" OR "games") AND ("physical education" OR "elementary school")

During the screening stage, the identified studies were systematically assessed based on their titles and abstracts to determine their initial relevance to the review objectives. Subsequently, during the eligibility stage, a comprehensive full text review was conducted for all studies that passed the initial screening. Articles were selected according to four predefined inclusion criteria: (1) publication between 2020 and 2026 to capture recent research developments; (2) publication type limited to primary empirical journal articles, with secondary sources such as review articles, books, and conference proceedings excluded; (3) publication language restricted to Indonesian and English; and (4) indexing in the Scopus, Google Scholar, or Garuda databases to ensure the quality and academic credibility of the included literature.

Following this systematic selection and eligibility assessment process, ten studies met all inclusion criteria and were included in the final synthesis. The entire review process, including study identification, screening, eligibility assessment, and final study selection, was documented transparently using the PRISMA 2020 flow diagram (Figure 1). The characteristics and publication trends of the included studies were analyzed descriptively, while the effectiveness of Game Based Learning in promoting deep learning outcomes was synthesized through a qualitative comparative analysis to address the research gap identified in this review.

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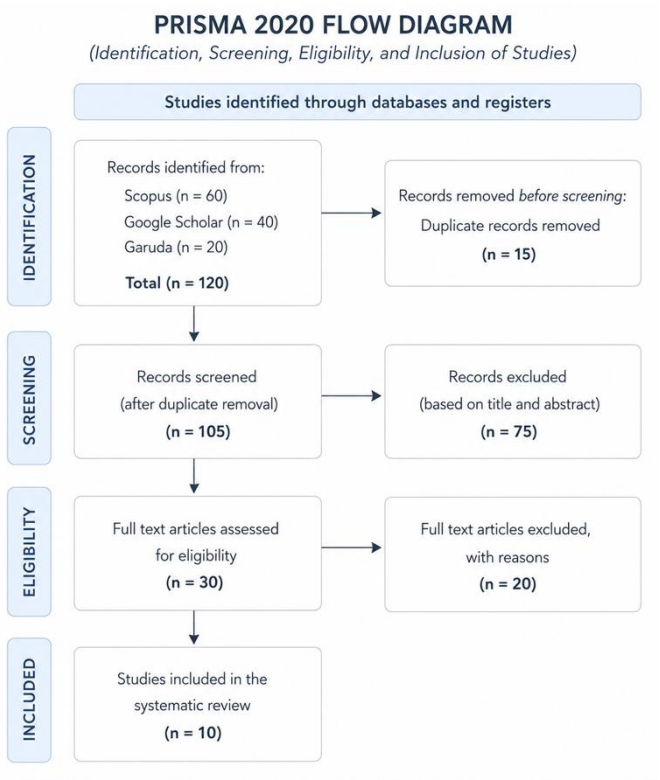


Figure 1. PRISMA Flow Diagram

RESULTS AND DISCUSSION

RESULTS

Following the study selection process based on the PRISMA 2020 guidelines, ten studies met all predefined inclusion criteria and were included in the final review. These studies specifically examined the contribution and effectiveness of Game Based Learning in promoting deep learning outcomes within the context of Physical Education, Sports, and Health (PESH) in elementary schools.

The selected studies were identified through a systematic search and screening process using predefined eligibility criteria across multiple scientific databases. The inclusion criteria comprised articles published between 2020 and 2026, written in either Indonesian or English, and indexed in Scopus, Google Scholar, or Garuda to ensure the quality and credibility of the evidence included in this review.

The included studies were published in a range of reputable national and international journals in the fields of physical education and sport sciences. The characteristics of the selected studies, including the article title, authors, year of publication, research methodology, and key findings, are summarized in Table 2.

Table 1. Summary of the Synthesized Studies (n = 10)

No.	Author(s) (Year)	Article Title	Research Method	Key Findings	Deep Learning Dimension(s)
1	(Arias-Estero et al., 2020)	*Effects of Two TGfU Lesson Periods on Game Performance, Knowledge, and Psychosocial Variables in Elementary Physical Education*	Experimental	The Teaching Games for Understanding (TGfU) model significantly improved game performance, game understanding, self competence, and psychosocial outcomes among elementary school students. Learning outcomes were influenced more by instructional quality than by	Mindful Learning, Meaningful Learning, Joyful Learning

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No.	Author(s) (Year)	Article Title	Research Method	Key Findings	Deep Learning Dimension(s)
				the duration of instructional sessions.	
2	(Gil-Arias et al., 2021)	*Hybrid TGfU Sport Education Model*	Quasi Experimental	The hybrid Teaching Games for Understanding (TGfU) and Sport Education (SE) model significantly enhanced students' learning motivation, engagement, enjoyment, and social interaction compared with the Direct Instruction approach.	Joyful Learning, Meaningful Learning
3	(Al Ardha et al., 2026)	*Teaching Games for Understanding Improves Object Control Skills*	Quasi Experimental	Technology supported deep pedagogical learning improved the quality of physical education by enhancing students' learning experiences, teacher competence, and instructional effectiveness.	Mindful Learning, Meaningful Learning
4	(Gustian et al., 2024)	*Effectiveness of Teaching Games for Understanding (TGfU): Using a Modified Kasti Game to Stimulate Elementary School Students' Motor Skills*	Experimental	The implementation of the TGfU model through a modified Kasti game significantly improved students' motor skills and encouraged active participation in physical education lessons.	Joyful Learning, Meaningful Learning
5	(Puput Melati Saputri et al., 2025)	*Implementation of Teaching Games for Understanding Through Soccer Like Games on the Decision Making Level of Elementary School Students*	Experimental	The TGfU model implemented through Soccer Like Games significantly improved students' game performance, including decision making, skill execution, and support during game situations.	Mindful Learning
6	(Apriani et al., 2025)	*Modified Volleyball Learning Through TGfU*	Quasi Experimental	The TGfU model significantly enhanced motor competence, locomotor skills, and object control skills among elementary school students, with greater improvements in locomotor skills observed among female students.	Meaningful Learning, Joyful Learning
7	(Parman et al., 2026)	*Volleyball Underhand Passing Learning Model Based on Teaching Games for Understanding*	Research and Development	The TGfU based learning model demonstrated excellent feasibility based on expert validation (86%), small group testing (85.3%), and large group testing	Meaningful Learning, Joyful Learning

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No.	Author(s) (Year)	Article Title	Research Method	Key Findings	Deep Learning Dimension(s)
		for Elementary School Students		(85%). It also received highly positive evaluations from teachers (88%) and students (86.6%).	
8	(Harvey et al., 2020)	*Effects of Teaching Games for Understanding on Tactical Knowledge Development in Middle School Physical Education*	Experimental	The TGfU model effectively enhanced students' tactical knowledge, including conceptual content, conceptual sophistication, and conceptual structure, thereby strengthening tactical reasoning and game evaluation skills.	Mindful Learning, Meaningful Learning
9	(Ariyanto et al., 2020)	*Traditional Games in Elementary Physical Education*	Experimental	Traditional games significantly improved elementary school students' fundamental movement skills by promoting active participation and enjoyable learning experiences during physical education lessons.	Meaningful Learning, Joyful Learning
10	(Sumarno et al., 2022)	*Development of a Game Based Learning Model in Physical Education*	Research and Development	A Game Based Learning model based on the TGfU approach was successfully developed as instructional material aligned with the characteristics of teachers, students, and school resources. The model demonstrated strong potential as an effective instructional strategy for Physical Education, although an adaptation period was required for implementation.	Mindful Learning, Meaningful Learning, Joyful Learning

DISCUSSION

The synthesis of the ten articles shows that Game Based Learning consistently contributes to improving the quality of Physical Education, Sports, and Health (PESH) learning in elementary schools. Although each study employed different types of games and instructional designs, all studies demonstrated the same tendency, namely improvements in cognitive abilities, motor skills, learning motivation, and students' active engagement during the learning process. These findings indicate that Game Based Learning has characteristics that are aligned with the implementation of deep learning, as it is capable of integrating knowledge, skills, and attitudes into meaningful learning experiences.

Based on the synthesis results, the Teaching Games for Understanding (TGfU) model was the most dominant approach used. Eight out of the ten articles employed TGfU as the primary model in PESH learning. This dominance indicates a paradigm shift in physical education from a technique centered approach toward an approach that places students at the center of the learning process through problem solving, decision making, and tactical understanding of games. (Arias-Estero et al., 2020) showed that the implementation of TGfU was able to improve game performance, game knowledge, self competence, and students' psychosocial outcomes, whereas (Harvey, S., & Jarrett, 2014) proved that the model

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significantly improved students' tactical knowledge through the development of conceptual content, conceptual structure, and reasoning ability. Both studies demonstrate that Game Based Learning is no longer oriented solely toward the mastery of technical skills but also promotes the development of thinking skills, which constitute the core of deep learning

Within the dimension of mindful learning, most studies indicate that Game Based Learning encourages students to think reflectively before taking action. (Puput Melati Saputri et al., 2025) found that the implementation of TGfU through Soccer Like Games improved students' decision making, skill execution, and support during game situations. It also enhanced students' ability to evaluate game situations and develop tactical reasoning. These findings demonstrate that games serve as a learning environment that enables students to develop critical thinking skills, analyze alternative courses of action, and determine the most appropriate solutions according to the game context. These characteristics represent the practical implementation of mindful learning, which emphasizes awareness, reflective thinking, and thoughtful engagement throughout the learning process.

The dimension of meaningful learning emerged as the most consistently identified characteristic across all included studies. Game Based Learning provides students with opportunities to construct understanding through direct experience rather than simply receiving information from the teacher. TGfU based Kasti games significantly improved elementary school students' motor skills, while (Apriani et al., 2025) reported improvements in motor competence, locomotor skills, and object control following the implementation of TGfU in volleyball instruction. Likewise, traditional games enhanced fundamental movement skills through contextual learning activities closely related to students' everyday experiences. These findings reinforce that Game Based Learning creates meaningful learning experiences by enabling students to construct knowledge through authentic activities, exploration, and direct interaction with the learning environment.

In addition to improving cognitive and motor outcomes, Game Based Learning also has a positive impact on affective aspects that characterize joyful learning. The hybrid TGfU and Sport Education model significantly increased students' intrinsic motivation, learning engagement, enjoyment, and social interaction compared with direct instruction. Furthermore, improvements were observed in students' psychosocial outcomes and perceived competence following participation in Game Based Learning activities. Traditional games also created an active and enjoyable learning environment that promoted the development of fundamental movement skills. These findings indicate that Game Based Learning is capable of creating a safe, enjoyable, and collaborative learning environment that provides students with opportunities to participate actively throughout the learning process.

The synthesis also indicates that the effectiveness of Game Based Learning is influenced not only by the instructional model itself but also by the quality of the learning materials used. TGfU based student worksheets were rated as highly feasible based on expert validation, small group trials, and large group trials, and received positive responses from both teachers and students. Similarly, Game Based Learning instructional materials developed using the TGfU model were designed according to students' characteristics, teachers' competencies, and school conditions. These findings suggest that the implementation of deep learning requires instructional materials that facilitate exploratory, collaborative, and reflective learning activities to achieve optimal learning outcomes.

Overall, the findings of this review demonstrate a consistent pattern indicating that Game Based Learning contributes to the holistic development of students' competencies. Its impact extends beyond improving movement skills to enhancing critical thinking, decision making, learning motivation, collaboration, and social interaction. Therefore, the characteristics of Game Based Learning are closely aligned with the principles of deep learning by fostering mindful learning through reflective thinking, meaningful learning through contextual learning experiences, and joyful learning through active, collaborative, and enjoyable instruction. This synthesis supports the recommendation that Game Based Learning is an appropriate instructional strategy for implementing deep learning in elementary school Physical Education, Sports, and Health (PESH).

CONCLUSION

Based on the findings of this Systematic Literature Review of ten studies that met the inclusion criteria, it can be concluded that Game Based Learning is an effective instructional strategy for supporting the implementation of deep learning in Physical Education, Sports, and Health (PESH) at the elementary school level. The Teaching Games for Understanding (TGfU) model emerged as the most widely adopted approach, as it effectively integrates the development of cognitive, psychomotor, and affective domains

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through contextual, student-centered game activities.

The synthesis revealed that Game Based Learning consistently contributes to improving students' critical thinking, decision making, tactical knowledge, motor skills, learning motivation, active engagement, and social interaction. These findings indicate that the characteristics of Game Based Learning are aligned with the three core dimensions of deep learning, namely mindful learning through the development of reflective thinking and problem solving, meaningful learning through contextual and meaningful learning experiences, and joyful learning through active, collaborative, and enjoyable learning environments.

In addition to the instructional model, the effectiveness of deep learning implementation is also influenced by the availability of instructional materials designed to accommodate students' characteristics and the school context, such as game based teaching materials and student worksheets. Therefore, Game Based Learning is not only a suitable alternative approach for Physical Education, Sports, and Health (PESH) instruction but can also be recommended as an effective strategy for implementing deep learning to support the holistic development of students' competencies in accordance with the demands of twenty first century education.

Future research is recommended to develop and evaluate Game Based Learning models that integrate digital technology, authentic assessment, and implementation across different educational levels and Physical Education, Sports, and Health (PESH) content areas in order to provide more comprehensive empirical evidence regarding the effectiveness of Game Based Learning in supporting the implementation of deep learning.

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