

Exploring the Impact of Game-Based Learning Models in Physical Education: A Bibliometric Analysis

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Exploring the Impact of Game-Based Learning Models in Physical Education: A Bibliometric Analysis

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ABSTRACT

Integrating game-based learning (GBL) models in physical education has emerged as a promising approach to enhancing student engagement and skill development. This study conducts a bibliometric analysis to explore the effectiveness of GBL in fostering physical education skills among students. Previous research has shown that GBL enhances motor skills, active participation, and learning achievement while fostering social interaction, teamwork, and communication skills. Game-based learning creates a motivating and inclusive environment that reduces anxiety and builds self-confidence, encouraging students to participate more actively in physical activities. However, the effectiveness of GBL may vary based on factors such as student age, game type, and curriculum integration. This study employs bibliometric analysis software, including VOSviewer and CiteSpace, to review scientific publications on GBL in physical education. The analysis identifies key trends, influential authors, and leading journals, providing comprehensive insights into the current state of GBL implementation and future directions. While GBL offers numerous benefits, challenges such as resource constraints and the need for teacher training are acknowledged, emphasizing the importance of careful planning and support strategies. This study aims to contribute to a deeper understanding of GBL's impact on physical education and provide guidance for its effective implementation in educational settings.

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1. INTRODUCTION

Physical Education/PE plays a vital role in shaping a healthy lifestyle¹² and developing physical skills in students (Moller, Sousa, Lee, Alon, & Lu, 2023). However, along with the development of technology and lifestyle changes, the challenges educators face in attracting students' attention to be actively involved in physical activities are increasing (Mazeas, Duclos, Pereira, & Chalabaev, 2022). One promising approach to overcome this challenge is implementing game-based learning (GBL) (Morley et al., 2021). This game-based learning model has shown great potential in increasing student motivation, strengthening their engagement in learning, and creating a fun and interactive experience (Claramita, Setiawati, Kristina, Emilia, & van der Vleuten, 2019). In physical education, GBL can be a

very effective tool for integrating physical concepts with more enjoyable learning strategies, making the learning process more relevant and engaging for the younger generation in the digital era (Fenanlampir, Leasa, & Batlolona, 2021). However, the implementation of GBL in physical education is not without challenges. Many studies have shown that although this model has great potential, its implementation in the field often encounters obstacles (Gusril, Komaini, Chaeroni, & Kalsum, 2022). Limited understanding of how to implement GBL effectively and the lack of training for educators on how to utilize technology in teaching are usually inhibiting factors. In addition, although various studies have examined the impact of GBL in multiple disciplines, research that focuses on the implementation of GBL in physical education is still limited. This raises important questions about how this model can improve learning outcomes in physical contexts and how to overcome the challenges in its management (Irmansyah et al., 2021).

The main problem faced in applying GBL in physical education is the ongoing lack of knowledge about designing and implementing effective games and learning objectives. In addition, research on the GBL model in physical education still rarely uses a more systematic analytical approach, such as bibliometric analysis, which can provide deeper insight into the development and trends of research in this field. Thus, this study aims to analyze the literature related to applying GBL in physical education through a bibliometric approach to identify research trends and key factors influencing the application of GBL and explore gaps in the existing literature (Muhtar, Supriyadi, & Lengkana, 2020).

The urgency of this research is very high, considering that physical education is an integral part of education as a whole, and implementing practical innovation can have a long-term impact on the quality of student learning. By utilizing GBL, learning can be created that not only hones students' physical skills but also improves their creativity, ability to work in teams, and social skills. Considering the importance of technology in education, this research is highly relevant to developing innovative learning models that are more integrated with the development of digitalization.

This study will answer several important questions: How can game-based learning improve learning outcomes in physical education? Based on existing literature, what are the emerging trends in applying GBL in physical education? And what factors influence the success or failure of GBL implementation in physical education? This study aims to understand current research trends through bibliometric analysis better and provide a clear picture of the challenges and opportunities in implementing GBL in physical education.

The main objectives of this study are to map and analyze research trends on game-based learning in physical education and identify factors that play a role in its success or failure. This study will guide educators, researchers, and policymakers in designing more effective, technology-based curricula and learning strategies. In addition, this study also aims to fill the gap in existing literature, especially regarding the application of GBL in the field of physical education, which is still limited.

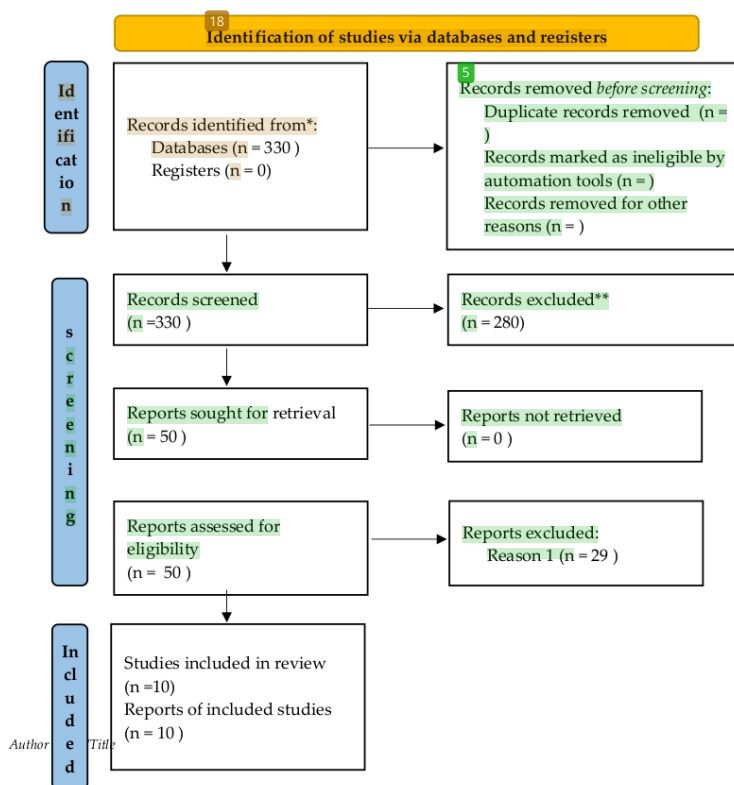
Previous research on GBL in education has shown positive impacts in various contexts, but few studies focus on physical education. Several previous studies have identified that GBL can increase students' motivation and engagement in physical education, but not all studies have shown consistent results (Muhtar, Supriyadi, Lengkana, & Cukarso, 2021). Many of these studies also rely on less comprehensive methods in evaluating the impact of GBL (Nurabadi, Suhariadi, Mardiyanta, Triwiyanto, & Adha, 2022). Therefore, this study is expected to offer a more in-depth analysis with a bibliometric approach, which can provide a comprehensive picture of how GBL is applied in physical education and the factors influencing its success (Suryadi et al., 2024).

One of this study's main contributions is analyzing the gap in the existing literature, especially regarding applying GBL in physical education (Taufik, Ridlo, Solahuddin, Iskandar, & Taroreh, 2022). Although many studies discuss game-based learning in the context of general education, not many systematically examine how this model is used in physical education. This gap creates an opportunity for this study to make new contributions to understanding the application of GBL in the context of physical education in a more comprehensive and structured manner.

Thus, this study is unique; it uses bibliometric analysis to map and explore research trends on applying GBL in physical education. This study fills the gap in the existing literature and provides insights that can be implemented in education policy, especially in designing more effective curricula and learning methods. This research is expected to create a clearer understanding of how GBL can be applied to improve learning outcomes in physical education and how to overcome existing challenges (Winarni & Lutan, 2020). In conclusion, this study aims to significantly contribute to physical education by analyzing research trends on game-based learning through a bibliometric approach. The results of this study can be used to improve the quality of physical education learning, support the development of more innovative curricula, and provide new insights for educators and researchers who want further to explore the application of technology in physical learning. This study also has the potential to encourage the development of learning models more oriented to the needs and characteristics of students in the digital era.

2. METHODS

This study uses a bibliometric analysis to explore game-based learning (GBL) models to develop students' physical education skills. This approach involves collecting and analyzing data from various scientific publications to identify trends, patterns, and relationships within the literature. By utilizing bibliometric software such as VOSviewer and CiteSpace, this study maps key topics, influential authors, and leading journals. The findings are expected to provide in-depth insights into the effectiveness and application of GBL models in physical education.



In the context of research on game-based learning (GBL) models for developing students' physical education skills, the first step is identifying the research problem. This study focuses on understanding how GBL models can be effectively integrated into the physical education curriculum to enhance students' motor and social skills. This step involves recognizing the challenges of traditional physical education and exploring how game-based approaches can offer innovative solutions. The process includes collecting initial data through surveys or interviews with educators and students to understand their needs and expectations clearly.

The second step is bibliometric data analysis. At this stage, the study employs software such as VOSviewer and CiteSpace to collect and analyze data related to GBL models from scientific publications. By applying strict inclusion and exclusion criteria, the study focuses on literature that discusses the implementation and effectiveness of these models in improving physical education skills. Bibliometric analysis allows researchers to map trends, identify influential authors and journals, and uncover relationships between key concepts in the literature. The results of this analysis are presented as visual diagrams that illustrate patterns and connections between studies, providing deeper insights into the effective implementation of GBL models.

Through this approach, the study aims to offer valuable recommendations for educators and stakeholders in developing a more dynamic and inclusive physical education curriculum. Search data on using Logical Operators in search Scopus namely (TITLE-ABS-KEY (learning AND model) AND TITLE-ABS-KEY ((game AND based) OR (GBL) OR (game-based) OR (game AND based AND model) OR (develop) OR (physical AND education))) AND PUBYEAR > 2013 AND PUBYEAR < 2025 AND (LIMIT-TO (SUBJAREA, "SOCI")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (SRCTYPE, "j")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (OA, "all")) AND (LIMIT-TO (PUBSTAGE, "final")) AND (LIMIT-TO (EXACTKEYWORD, "Educational Model") OR LIMIT-TO (EXACTKEYWORD, "Elementary School") OR LIMIT-TO (EXACTKEYWORD, "Game-based Learning") OR LIMIT-TO (EXACTKEYWORD, "Physical Activity") OR LIMIT-TO (EXACTKEYWORD, "Physical Education")) AND (LIMIT-TO (AFFILCOUNTRY, "Indonesia"))

The analysis of search results based on predetermined criteria focuses on exploring game-based learning models in the context of physical education. Using key terms such as "learning model," "game-based learning," and "physical education," this study aims to identify relevant literature published between 2014 and 2024. The primary objective is to examine how these learning models are implemented and their impact on improving students' physical education skills. Focusing on journal articles in the social sciences (SOCI) published in English, this study seeks to understand the trends and patterns of game-based learning model implementation in educational settings.

A rigorous analytical approach was applied, incorporating strict search constraints, including article document type (DOCTYPE "ar"), journal source type (SRCTYPE "j"), and publications that have reached the final stage (PUBSTAGE "final"). Additionally, the language was restricted to English to ensure the accessibility and quality of the literature analyzed. The geographic focus on Indonesia highlights local contributions to implementing game-based learning models. By targeting specific keywords such as "educational model," "elementary school," and "game-based learning," this study aimed to identify research that provides in-depth insights into the integration of game-based approaches in physical education curricula.





The results of this analysis are expected to map the relationships between key concepts in the literature and highlight the most influential authors and journals in this field. This study can offer practical recommendations for educators and policymakers to develop more dynamic and inclusive curricula by identifying patterns and trends in implementing game-based learning. Additionally, it contributes to a deeper understanding of how innovative learning approaches can enhance students' motor and social skills while promoting more effective and enjoyable physical activity in elementary schools in Indonesia.

3. FINDINGS AND DISCUSSION

Review: Articles with top 10 references based on number of citations

The top 10 most-cited articles related to learning models, "game-based learning," and "physical education" are presented in Table 1.

Table 1. Articles About Game-Based Learning Models and Physical Education

Author(s) ID	Title	Year	Cited by	Publisher
15729539900; 57195384445; 6504600970; 6504322013; 7007111210	Community-based educational design for undergraduate medical education: A grounded theory study (Claramita et al., 2019)	2019	46	BioMed Central Ltd.

57208600285; 57194710348; 57205208976; 57217038124; 57218314981	Digital principal instructional leadership in the new normal era (Nurabadi et al., 2022)	2022	18	Institute of Advanced Engineering and Science
57214720500; 57484883500; 57211742363	Character development-based physical education learning model in primary school (Muhtar et al., 2020)	2020	13	Horizon Research Publishing
57222497685; 57222489535; 57211746955; 57222492094; 57221385767	Application of YouTube-Based Virtual Blended Learning as a Learning Media for Fundamental Movement Skills in Elementary Schools during the Covid Pandemic 19 (Taufik et al., 2022)	2022	11	Asian Exercise and Sport Science Association
59226981900; 9840368700	Empathy and tolerance in physical education: Cooperative vs. classical learning; [Empathy and tolerance in education physical: Learning cooperative vs. classical] (Winarni Lutan, 2020)	2020	11	Yogyakarta State University
58293015400; 57224962924; 58195880000; 58164051500; 57875697200; 58799254400; 42861436300; 57200069837; 58262291600; 58040445300; 59003373100	How does cooperative learning work with students? Literature review in physical education: [¿ Cómo function el learning cooperatively with alums? Revision bibliography about education physics] (Suryadi et al., 2024)	2024	10	Federacion Espanola de Docentes de Educación Physics
57215590479; 57220027089; 57215586236; 57193768454; 57729671600; 57950184800	Physical literacy in the culture of physical education in elementary schools: Indonesian perspectives (Irmansyah et al., 2021)	2021	9	Horizon Research Publishing
57208009683; 57188716662; 57192589179	The development of a homogeneity psycho cognition learning strategy in physical education learning (Fenanlampir et al., 2021)	2021	9	Institute of Advanced Engineering and Science
57210913635; 57222053696; 57193789399; 57224829500; 59208260600	The Effect of Physical Activity-Based Physical Education Learning Model in the Form of Games (Gusril et al., 2022)	2022	9	Horizon Research Publishing
57214720500; 57484883500; 57211742363; 57212874712	Character education in physical education learning model: A bibliometric study on 2011-2020 Scopus database (Muhtar et al., 2021)	2021	9	Horizon Research Publishing

Table 1 presents ten of the most frequently cited references in the context of learning models based on educational and physical games. These references cover various studies exploring innovations in physical education, including community-based education design, digital instructional leadership, and character-based learning models. These studies provide valuable insights into implementing and

36 ctical approaches to innovative learning, such as cooperative and physical activity-based learning. The selected references were chosen based on their relevance and significant contributions to the development of student's physical education skills and their impact on enhancing social and motor skills. These studies 27 Published by leading publishers, offer a comprehensive perspective on trends and developments in physical education, particularly at the elementary school level in Indonesia.

The first article highlights the urgency of the study, emphasizing the need to improve medical education for undergraduate students through an integrated community-based education (CBE) approach in primary healthcare. In many developing countries, the concept of maintaining quality primary healthcare remains insufficiently understood, creating a need for more curriculum guidance. This study aims to develop a CBE framework that can be implemented at various curriculum levels (macro, meso, and micro) to enrich medical students' learning experiences. In conclusion, this study's resulting 'CBE-tree' model provides a comprehensive guide for designing a more contextually relevant undergraduate curriculum, focusing on clinical skills, leadership, and teamwork. This framework enables students and educators to understand better and appreciate the importance of primary healthcare maintenance, facilitating 25 more meaningful and sustainable learning in general health practice. This article proposes a community-based educational design for undergraduate medical education. Based on the theory explored in this study, a community-based approach is believed to enrich the medical education experience by connecting students to the real world through direct interaction with the community. Cited 46 times, this article is influential in discussing how community-based learning can build practical skills for medical students, which are not only limited to mastery of the material but also include communication skills and social understanding. These findings are especially relevant in higher education, where applying theory to real-world practice is key to educational success.

The second article explores the need to adopt digital instructional leadership roles among school principals in the new standard era influenced by the pandemic. The uncertainty surrounding SARS-CoV-2 and the necessity for alternative teaching methods have pushed school leaders to adapt and modify their leadership approaches. This research is crucial for understanding how school principals can support online learning, address challenges in home-based learning, and effectively manage virtual schools. The study highlights that field data support a thriving digital instructional leadership model. Key factors influencing success include providing support for online learning, proactively addressing home-based learning challenges, and effectively managing virtual schools. Instructional leaders must possess adaptive and flexible capacities to learn and grow during crises while providing adequate responses to future challenges. This article, cited 18 times, offers important insights into how principals can leverage digital technology 11 improve teaching and school management amid the challenges of the pandemic. The application of technology in education is related not only to learning materials but also to classroom management, communication, and distance learning strategies, which are increasingly important in an increasingly digitally connected world.

The third article emphasizes the need to integrate character education into physical education. Physical education teachers require a conceptual framework that guides implementing character education, considering the importance of fostering good character in students. This research outlines steps teachers can follow to cultivate nine essential character traits in physical education: respect, responsibility, care, honesty, fairness, civility, trustworthiness, teamwork, and religiosity. The Integrated Model has proven effective in fostering students' character development in urban and rural areas at the elementary school level. With 13 citations, this study suggests that physical education aims to develop not only physical skills but also students' character, such as discipline, cooperation, and a sense of responsibility. This character-based learning model is becoming increasingly relevant, especially in an era where education is focused on academic mastery and the formation of students' characters to face social challenges.

The fourth article discusses using YouTube-based virtual learning media to enhance elementary school students' fundamental movement skills. Given the necessity of remote learning during the

pandemic, this media offers an innovative solution for physical education. The study demonstrates that using YouTube-based virtual applications significantly improves students' fundamental movement skills. Applying these learning media, with clear and explicit instructional guidance, has brought significant positive changes in students' motor skill development. This article, cited 11 times, explores the use of YouTube as a blended virtual learning medium for basic movement skills in elementary schools during the COVID-19 pandemic. Utilizing digital platforms shows how technology can be adapted to support physical learning that is usually done in person but is hampered by pandemic restrictions. This research provides new insights into how physical education can be carried out effectively in the virtual world, which could be a solution for learning outside the physical classroom.

The fifth article highlights the potential of physical education in introducing moral values such as empathy and tolerance. The urgency of this study lies in the need to provide empirical evidence on the effectiveness of specific learning methods in instilling moral values. The results indicate cooperative learning is more effective than traditional learning methods in fostering moral values. Additionally, students with high cognitive abilities tend to develop stronger moral values, although no significant interaction effect was found. This article, cited 11 times, reveals that cooperative learning can create a more inclusive environment, encourage more positive social interactions among students, and facilitate their social-emotional development. This study highlights the importance of focusing not only on the physical aspects of physical education but also on the social skills that develop through interactions between students.

The sixth article emphasizes the importance of cooperative learning as an educational approach that enhances learning outcomes in physical education. Cooperative learning has been shown to improve students' motivation, participation, social skills, and academic achievement. This study found that when tailored to learning objectives and student characteristics, cooperative learning strategies are special in enriching students' learning experiences and achievements in physical education. Further research is needed to explore the application and global impact of cooperative learning. By citing this article 10 times, this study provides a deeper understanding of how cooperative approaches can improve the effectiveness of physical education learning. Collaborative learning has been shown to support social skills, increase motivation, and improve learning outcomes in physical activities, making it a highly relevant model for physical education at various levels.

The seventh article discusses the development of a physical literacy model within the culture of physical education in elementary schools. Physical literacy is a promising solution to address global concerns about declining interest in physical activity. Experts and practitioners have agreed on a developed physical literacy model that aligns with the cultural context of elementary school physical education. This model can be effectively implemented to promote greater student engagement in physical activity. This study, cited 9 times, highlights the importance of physical literacy for children's development of physical skills and healthy lifestyles. This article emphasizes that physical literacy should be integral to the physical education curriculum to foster active habits from an early age.

The eighth article focuses on developing new learning strategies for psychology and student intelligence development in physical education, sports, and health. The Psychocognitive Homogeneity (HPC) learning strategy developed in this study has been proven to enhance student learning outcomes. Expert validation confirms that this strategy is feasible for implementation, with only minor revisions required. This article, cited nine times, provides an overview of how physical education can be tailored to support students' cognitive development on a more individual basis, especially for those who require a more personalized approach to learning.

The ninth article presents a study on developing a physical education learning model for the Anak Dalam Sakai Tribe in Riau Province, Indonesia. This model is based on traditional play activities, which are valid, practical, and effective for physical education learning. Traditional play activities contribute significantly to students' learning experiences, making them an essential component of culturally responsive education. With nine citations, this article examines the effects of a physical education learning model based on physical activity in the form of games. This study shows that using games as

part of physical education learning can increase student participation and positively impact their motor skills and physical fitness. This game-based learning model effectively makes physical education more enjoyable and acceptable to students from various backgrounds.

The tenth and final article addresses the need for a physical education learning model that integrates character education to improve students' fitness and overall development through physical activity. This bibliometric study reveals limited academic attention to character-based physical education learning models. Further research is needed to map out future research directions and encourage more publications on integrating character education into physical education. With nine citations, this article reveals how character education is gaining attention in the context of physical education and identifies key trends and emerging topics in research related to character education. This study is an essential reference for researchers interested in exploring the relationship between physical education and student character development.

Based on the results of the research that has been analyzed, the application of character-based learning models, cooperative learning, and digital technology in physical education significantly improves the quality of learning and student engagement. The character-based learning model applied in physical education has been proven to improve physical skills and shape students' characteristics, such as discipline, cooperation, and responsibility (Silva, Ferraz, Forte, Teixeira, & Marinho, 2022). This is to the research findings of (Leary, Longmore, & Medcalf, 2018), which show that educational characteristics integrated into physical learning can form more character and responsible students in their physical activities. In addition, cooperative learning, as expressed in the research of (Xu et al., 2022), significantly improves social skills, empathy, and tolerance among students, making physical education learning more inclusive and interactive. This study also confirms that the cooperative learning model effectively creates an environment that supports collaboration, which is essential for students' social development (Sargent, Killian, Garcia-jaen, García-martínez, & Ferriz-valero, 2023).

Furthermore, the use of digital technology in physical education learning, as explained in the research of (Segura-robles, Parra-gonzález, & Gallardo-vigil, 2020) regarding the use of YouTube based on blended learning, shows great potential to overcome obstacles arising from physical restrictions, such as those that occurred during the Covid-19 pandemic. The application of digital technology in physical education enables learning fundamental movement skills through an easily accessible and repeatable platform, providing flexibility in the learning process that is very much needed in today's digital era. These results are also supported by research by (Sciences, 2017), which shows the importance of physical literacy in basic education in Indonesia, which involves teaching physical skills and increasing students' awareness of a healthy lifestyle. Overall, the results of this study indicate that physical education involving a character-based approach, cooperative learning, and digital technology can produce more comprehensive and relevant knowledge with the times. Although challenges in implementing these models still exist, especially regarding training for educators and effective use of technology, these findings provide important insights for designing a more adaptive and integrative physical education curriculum. Further research is needed to dig deeper into the factors that influence the success or failure of implementing these models and identify new ways to overcome obstacles that may arise in the field.

Discussion

This study aims to explore research trends on applying game-based learning (GBL) in physical education using a bibliometric approach. The analysis results show that although GBL has been accepted as an effective learning model in various educational fields, its application in physical education is still in development and requires further research (Teresa, Danilo, Simone, Cagnetta, & Eleni, 2021). The interpretation of the results of this study reveals that the application of GBL in physical education has a positive impact on student engagement and motivation and has the potential to improve physical skills learning more interestingly and interactively (Sproule & Williams, 2022). In the context of theory, the results of this study are closely related to constructivist learning theories that emphasize active learning, where students participate directly in the learning process through

experience and reflection (Kim, Sullivan, Chung, & Sullivan, 2022). This reflects the importance of GBL's role in creating a more personal and authentic learning experience, where students are physically and cognitively involved in solving problems through games (Mace et al., 2017).

However, the results of this study also show challenges in implementing GBL effectively in physical education, especially in terms of the application of digital technology, which sometimes faces obstacles related to access and technical skills among educators and students. This finding is consistent with previous studies that reveal that although technology can be a handy tool, challenges in its utilization in the field remain obstacles that must be overcome. For example, the use of digital media such as YouTube in learning fundamental movement skills, as described in the study by (Chang, Warden, & Lin, 2018), shows promising results but also highlights the issue of access and technical understanding that are significant obstacles in some schools, especially in areas that are not yet fully integrated with technology. Therefore, although GBL offers much potential to improve the quality of physical education, its implementation requires adequate infrastructure and training readiness to ensure its success.

The results of this study also contribute to the development of physical education theory, especially in terms of character integration in physical learning. In their research, the character-based learning model applied by (Oppici et al., 2022) shows that student character development can be improved through physical learning emphasizing values such as discipline, cooperation, and a sense of responsibility. This finding is in line with other studies that show that physical education can potentially develop physical skills and students' character. This is important because physical education is aimed at improving physical fitness and forming characters that can support students' social and emotional development outside the classroom (Luo, Lin, Hsu, Liao, & Kao, 2020). Thus, implementing GBL involving collaboration and social interaction not only supports the development of physical skills but also enriches students' character experiences, which should be an integral part of physical education in schools (Augusto, Vaghetti, Sobral, Finco, & Silva, 2018).

On the other hand, this study also provides significant implications for learning practices in the field. In the context of physical education, applying GBL can provide a more enjoyable and relevant experience for students. This approach invites students to be physically active and stimulates their cognitive and social aspects through games designed to develop physical skills while strengthening relationships between students. Cooperative learning applied in the GBL model, as discussed in the research of (Trajkovi, 2022), is very effective in improving students' social skills, empathy, and tolerance. In cooperative learning, students are trained to work in teams, share roles, and support each other, which are essential social skills that every individual must have in this increasingly connected world. In addition, the positive impact of game-based learning in physical education can also be seen in the increase in student motivation to participate in physical activities. By integrating games into learning, students feel challenged and enjoy the learning process more. This is in line with the findings of (Hung & Kao, 2022), which show that cooperative learning in physical education can increase students' motivation to actively participate in physical activities, especially when they feel involved in a group that supports them.

In this context, GBL offers a new way to overcome the problem of low student motivation in participating in physical education learning, which is often considered less interesting than other subjects. However, although the results of this study provide many positive insights into applying GBL in physical education, several limitations need to be noted. One is the limitation of the bibliometric methodology used in this study. Although bibliometric analysis provides a broad overview of research trends in a field, this approach ignores the depth of analysis of the quality and context of each study analyzed. For example, this study did not explore further how educators implement the GBL model in the field or the challenges faced in implementing it in the classroom. Therefore, although bibliometric analysis provides valuable information, this approach can explore the practical experiences faced by educators directly involved in learning.

Another ²¹ limitation of this study is its limited focus on literature indexed in specific databases, such as Scopus. This may have caused some relevant studies that were not indexed in these databases to be missed. Therefore, the results of this analysis may not fully reflect the overall development of GBL implementation in physical education. To obtain a more comprehensive picture, further research can integrate various data sources, including literature that may not be indexed in major databases, and expand the scope of the analysis to different countries and educational contexts. Given these limitations, suggestions for future research are to develop more in-depth studies on GBL implementation in physical education contexts. One approach that can be used is to combine qualitative methods, such as in-depth interviews or field observations, to better understand the experiences ³⁴ educators and students in using the GBL model. Longitudinal research is also highly recommended to assess the long-term impact of GBL implementation on students' physical skills, character, ¹³ and learning outcomes. In addition, further research could explore the potential for integrating more sophisticated technologies, such as Augmented Reality (AR) or Virtual Reality (VR), into physical education to see how these technologies can enhance student engagement and learning outcomes in a more immersive context.

Furthermore, this study also highlights the importance of considering digital technologies' social and ethical implications in physical education. One key issue is the gap in access to technology between students in areas with adequate facilities and those without. This can exacerbate inequalities in education, where students from low-income backgrounds may not have equal access to digital devices or internet connections needed ¹² to engage in technology-based learning. Therefore, educators and policymakers need to ensure that the application of technology in physical education is inclusive by addressing access gaps and making efforts to address these issues. In addition, technology in physical education also requires attention to student privacy and data protection issues, mainly when digital platforms are used to collect personal information.

This study provides important insights into applying GBL in physical education and its contribution to educational theory and practice. Considering the existing limitations and suggestions for future research, a deeper understanding of how GBL can be effectively integrated into physical education can be created to increase student engagement, physical skill development, and character building. These findings' social and ethical implications also remind us of the importance of fair and inclusive policies in adopting technology in education to ensure that all students, without exception, can benefit equally from this educational innovation.

4. CONCLUSION

This study has analyzed research ⁴⁸ trends related to game-based learning (GBL) applications in physical education through a bibliometric approach. The study's results indicate that although GBL has been proven effective in various educational fields, its application in physical education is still relatively new and requires further development. Applying GBL in physical education significantly increases student engagement, strengthens physical skills, and supports student character development through a fun and interactive game-based approach. In addition, the cooperative learning model, often combined with GBL, effectively improves students' social skills, such as empathy and tolerance, which are very important in physical education oriented toward social-emotional development. However, challenges in implementing GBL in the field remain, especially related to limited ¹³ technological infrastructure and technical understanding among educators. Therefore, although the results of this study indicate the great potential of GBL in physical education, its successful implementation requires more substantial support in terms of educator training and the provision of ² adequate resources. In addition, the analysis results also show gaps in the existing literature, which suggests the need for further research to explore practical experiences and the long-term impacts of implementing GBL in physical education.

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Conflicts of Interest: Declare conflicts of interest or state “The authors declare no conflict of interest.” Authors must identify and declare any personal circumstances or interests that may be perceived as inappropriately influencing the representation or interpretation of reported research results.

REFERENCES

- Augusto, C., Vagheti, O., Sobral, R., Finco, M. D., & Silva, S. (2018). *Exergames Experience in Physical Education : A Review*. LXXVIII(Rosenberg 2013), 23–32. <https://doi.org/10.2478/pcssr-2018-0010>
- Chang, C., Warden, C. A., & Lin, G. (2018). *Effects of digital game-based learning on achievement , flow and overall cognitive load*. 34(4), 155–167.
- Caramita, M., Setiawati, E. P., Kristina, T. N., Emilia, O., & van der Vleuten, C. (2019). Community-based educational design for undergraduate medical education: a grounded theory study. *BMC Medical Education*, 19, 1–10.
- Fenanlampir, A., Leasa, M., & Batlolona, J. R. (2021). The Development of Homogeneity Psycho Cognition Learning Strategy in Physical Education Learning. *International Journal of Evaluation and Research in Education*, 10(3), 1047–1059.
- Gusril, W. R., Komaini, A., Chaeroni, A., & Kalsum, U. (2022). The Effect of Physical Activity-Based Physical Education Learning Model in the Form of Games. *International Journal of Human Movement and Sports Sciences*, 10(5), 906–912.
- Hung, C., & Kao, Y. (2022). *Learning More About the Effects of Gamification on Physical Activity . Comment on “ Evaluating the Effectiveness of Gamification on Physical Activity : Systematic Review and Meta-analysis of Randomized Controlled Trials ” Corresponding Author : Related Articles : 24, 1–2*. <https://doi.org/10.2196/36396>
- Irmansyah, J., Susanto, E., Lumintuarso, R., Sugiyanto, F., Syarif, A., & Hermansyah, H. (2021). Physical literacy in the culture of physical education in elementary schools: Indonesian perspectives. *Int J Hum Mov Sport Sci*, 9(5), 929–939.
- Kim, H., Sullivan, D. M. O., Chung, S. H., & Sullivan, D. M. O. (2022). *Applying Gamification Principles and Therapeutic Movement Sequences to Design an Interactive Physical Activity Game : Development Study Corresponding Author : 10, 1–15*. <https://doi.org/10.2196/38133>
- Leary, N. O., Longmore, C., & Medcalf, R. (2018). *Factors influencing a physical education teacher ' s pedagogical games practices with pupils experiencing social , emotional and mental health issues*. 1–18.
- Luo, Y., Lin, M., Hsu, C., Liao, C., & Kao, C. (2020). *sustainability The Effects of Team-Game-Tournaments Application towards Learning Motivation and Motor Skills in College Physical Education*. 1–12.
- Mace, M., Kinany, N., Rinne, P., Rayner, A., Bentley, P., & Burdet, E. (2017). *Balancing the playing field : collaborative gaming for physical training*. 1–18. <https://doi.org/10.1186/s12984-017-0319-x>
- Mazeas, A., Duclos, M., Pereira, B., & Chalabaev, A. (2022). Evaluating the Effectiveness of Gamification on Physical Activity: Systematic Review and Meta-analysis of Randomized Controlled Trials. *Journal of Medical Internet Research*, 24(1). <https://doi.org/10.2196/26779>
- Moller, A. C., Sousa, C. V., Lee, K. J., Alon, D., & Lu, A. S. (2023). A comprehensive systematic review and content analysis of active video game intervention research. *Digital Health*, 9. <https://doi.org/10.1177/20552076231171232>
- Morley, D., Rudd, J., Issartel, J., Goodway, J., O'Connor, D., Foulkes, J., ... Miller, A. (2021). Rationale and study protocol for the Movement Oriented Games Based Assessment (MOGBA) cluster randomized controlled trial: A complex movement skill intervention for 8–12 year old children within ‘Made to Play.’ *PLoS ONE*, 16(6 June). <https://doi.org/10.1371/journal.pone.0253747>
- Muhtar, T., Supriyadi, T., & Lengkana, A. S. (2020). Character development-based physical education learning model in primary school. *International Journal of Human Movement and Sports Sciences*, 8(6), 337–354.
- Muhtar, T., Supriyadi, T., Lengkana, A. S., & Cukarso, S. H. I. (2021). Character education in physical education learning model: A bibliometric study on 2011-2020 scopus database. *International Journal of Human Movement and Sports Sciences*, 9(6), 1189–1203.

- Nurabadi, A., Suhariadi, F., Mardiyanta, A., Triwiyanto, T., & Adha, M. A. (2022). Digital principal instructional leadership in new normal era. *International Journal of Evaluation and Research in Education*, 11(3), 1090–1098.
- Oppici, L., Stell, F. M., Utesch, T., Woods, C. T., Foweather, L., & Rudd, J. R. (2022). A Skill Acquisition Perspective on the Impact of Exergaming Technology on Foundational Movement Skill Development in Children 3 – 12 Years : A Systematic Review and Meta - analysis. *Sports Medicine - Open*, (December). <https://doi.org/10.1186/s40798-022-00534-8>
- Sargent, J., Killian, C., García-jaen, M., García-martínez, S., & Ferriz-valero, A. (2023). *Flipped learning in physical education : A scoping review*. (7491). <https://doi.org/10.1177/1356336X221120939>
- Sciences, S. (2017). “ *University Challenges* ” : Addressing Transition and Retention through Games-Based Learning. 427–434.
- Segura-robles, A., Parra-gonzález, M. E., & Gallardo-vigil, M. Á. (2020). *Bibliometric and Collaborative Network Analysis on Active Methodologies in Education*. 9, 259–274. <https://doi.org/10.7821/naer.2020.7.575>
- Silva, A., Ferraz, R., Forte, P., Teixeira, J. E., & Marinho, D. A. (2022). *Classes in School Context : Theoretical Considerations and Future Perspectives*.
- Sproule, J., & Williams, C. (2022). *Edinburgh Research Explorer Can continuing professional development utilizing a game- centered approach improve the quality of physical education teaching delivered by generalist primary school teachers ?*
- Suryadi, D., Okilanda, A., Nofrizal, D., Suganda, M. A., Tulyakul, S., Ahmed, M., ... Wati, I. D. P. (2024). How does cooperative learning work with students?: Literature review in physical education. *Retos: Nuevas Tendencias En Educación Física, Deporte y Recreación*, (55), 527–535.
- Taufik, M. S., Ridlo, A. F., Solahuddin, S., Iskandar, T., & Taroreh, B. S. (2022). Application of youtube-based virtual blended learning as a learning media for fundamental movement skills in elementary schools during the covid pandemic 19. *Annals of Applied Sport Science*, 10(1), 0.
- Teresa, M., Danilo, B., Simone, C., Cagnetta, F., & Eleni, V. F. (2021). *PhyDSL K : a model-driven framework for generating exergames*. 27947–27971.
- Trajkovi, N. (2022). *Intervention Improves Physical Fitness in 12 – 14-Year-Old Girls*. 10(February), 8–13. <https://doi.org/10.3389/fpubh.2022.831424>
- Winarni, S., & Lutan, R. (2020). Emphaty and tolerance in physical education: Cooperative vs. classical learning. *Cakrawala Pendidikan*, 39(2), 332–345.
- Xu, L., Shi, H., Shen, M., Ni, Y., Zhang, X., & Pang, Y. (2022). *The Effects of mHealth-Based Gamification Interventions on Participation in Physical Activity : Systematic Review Corresponding Author : 10*. <https://doi.org/10.2196/27794>

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