Jurnal Sustainable

Volume 7 Number 1 2024, 106-118
E-ISSN: 2655-0695
DOI:https://doi.org/ 10.32923/kjmp.v7i1.4463

Bibliometric Analysis of Learning Models and Physical Education

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Abstract

This study aims to explore the literature on learning models in physical education based on scopus indexed articles. The research method used to conduct the analysis is bibliometric. Search and filtering strategy using PRISMA flow chart. The research review uses data in comma-separated values (CSV) format, which is then exported to Microsoft Excel and to visualize the search results of bibliometric analysis the tool used is VOSviewer. The analysis resulted in the development of publications in the domain of learning models in physical education experiencing an increasing trend from year to year. Goodyear, V.A became the most prolific author by publishing as many as 5 research documents. The influential researcher with the most citations was written by Goodyear & Casey in 2015 (134 citations), the title of the article Innovation with change: developing a community of practice to help teachers move beyond the 'honeymoon' of pedagogical renovation. During the period 2012-2023, Indonesia became the country that has conducted the most research publications on the topic of learning models in physical education. While the country with the most citations is the United Kingdom with a total of 422 citations. The keywords that appear most in search analysis are physical education, learning model, cooperative learning, physical activity, e-learning, pedagogy, soccer, learning, motivation, and motor learning. The conclusion of the study resulted in the development of publication of learning models in physical education in the 2012-2023 period tended to increase. This shows that research trends on the topic of learning models in physical education are of international concern.

Keywords: learning models, learning methods, physical education

History:
Received : 16 May 2024
Revised : 19 May 2024
Accepted : 29 May 2024
Published : 11 June 2024
[14]Universitas Tanjungpura
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Publishers: LPM IAIN Shaykh Abdurrahman Siddik Bangka Belitung, Indonesia

Introduction

Each individual has different characteristics and learning needs. So schools need to support student development, both inside and outside of school, as well as the physical, psychological, cognitive, social, and emotional processes that affect students, by adjusting learning strategies and creating appropriate learning environments (Darling-Hammond et al., 2020). Emphasizes the importance of teaching strategies that support independence and the fulfillment of psychological needs, in increasing student engagement and academic achievement. So it is necessary to create a supportive classroom environment and continuous professional development for educators to increase learning competence and student motivation (Del Valle Díaz et al., 2021). In addition, learning is also important to create meaningful experiences in physical education and sports for students. Such experiences can increase student participation, make learning personally relevant, and encourage commitment to a physically active lifestyle over the long term (Beni et al., 2017). Teachers as educators can manage classes to build positive relationships with students, manage classes effectively, and solve behavioral problems, education is not only about knowledge transfer, but also about character development and social skills (Frenzel et al., 2021). The importance of creating a positive learning environment to increase student motivation and achievement in physical education, which impacts demand, personality improvement, motor skills, sports participation, mental well-being, and aspects of healthy living positively affecting student orientation, intrinsic motivation, and overall learning outcomes in physical education (Barrachina-

Peris & Moreno-Murcia, 2022; Jaitner et al., 2019). So to optimize these goals, an effective learning strategy is needed.

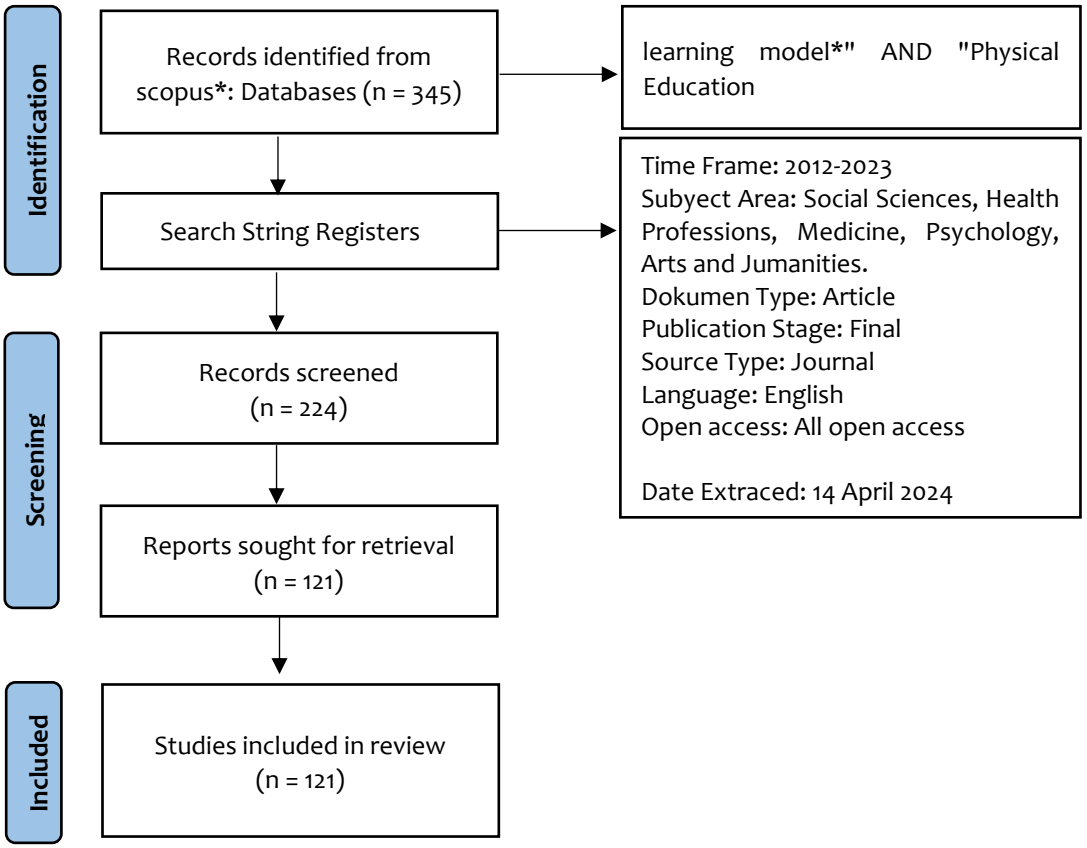
Discussing the importance of creating a positive and supportive learning environment, in the frame of teaching strategies or learning models oriented to student competence is an interesting and important thing to explore. Among them is a learning model with a conceptual physical education program approach and fitness education in schools to increase lifelong physical activity, health, and well-being (Corbin, 2021). Furthermore, the inquiry and discovery learning model has the effect of increasing creativity, characterized by student-centered learning that gives full freedom to students to search, try, and analyze problems related to learning material (Juliantine et al., 2022). Learning by paying attention to psychological aspects also plays an important role in education, because it affects learning activities, motivation, learning achievement and overall educational experience (Muro et al., 2018; Nopembri & Sugiyama, 2022; Prenger & Schildkamp, 2018). For example, research by (Gao et al., 2011) discusses the mediating role of *self-efficacy* in high school students' learning achievement goals, motivational climate, and physical activity in physical education environments. The results suggest that *self-efficacy* plays an important role in influencing students' motivation and engagement in physical education, especially when associated with goal-based skill mastery and building a climate involving skill mastery. The study underscores the importance of fostering self-efficacy to improve achievement behavior and encourage physical activity among adolescents in school settings. Further research conducted by (Muhtar et al., 2021) about the character-based physical education learning model, which reveals the importance of character development, collaboration values, and special character promoted in physical education. The results also highlight the importance of bibliometric analysis in guiding future research in this area. However, there are also several recommendations from this study, including bibliometric investigations in this study are still limited. The study focuses more on the context of improving character quality in the physical education learning model from the perspective of the study. Therefore, the various fields and focus of this research can still be explored further.

By considering these studies, this study is believed to be important to map bibliographic information from certain fields, especially to examine the direction of research development related to learning models in physical education that are often published. Therefore, this study aims to explore literature on the direction of research development on the topic of learning models in physical education based on Scopus indexed articles in the period 2012 – 2023. To achieve this goal, an analysis was carried out on the development of physical education learning model research from 2012 to 2023, including publication growth patterns, influential journals, leading authors, influential articles, countries, and keywords that are often used in research on the topic of learning models in physical education during the period.

Method

The research method used by the analysis is bibliometric. General bibliometric analysis examines trends in scientific publications as well as relationships between publications based on bibliographic data. This method was first used by Wyndham Hulme under the title "Statistical Bibliography" and is described as a study book or other communication medium through mathematical and statistical methods (ŞahïN et al., 2023). The data source was collected from in the Scopus database on April 14, 2023. Scopus is a very important source of information because it provides a comprehensive overview of global research results in various fields, from science, technology, medicine, social sciences, to arts and humanities. In the context of bibliometric analysis, the importance of proper keyword selection cannot be overstated as it directly affects the results obtained (Gazali & Saad, 2023). To achieve that goal, data searches are performed using Boolean logic such as "AND" and "OR" in Scopus.(Simbolon et al., 2023), leads to searches with the following keywords: (TITLE-ABS-KEY ("learning model*" OR "learning method*") AND TITLE-ABS-

KEY ("Physical Education" OR "sport pedagogy" OR "sport education")) AND PUBYEAR > 2012 AND PUBYEAR < 2023 AND (LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "HEAL") OR LIMIT-TO (SUBJAREA , "MEDI") OR LIMIT-TO (SUBJAREA , "ARTS") OR LIMIT-TO (SUBJAREA ,



"PSYC")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (OA , "all")) An initial search yielded 345 documents. Next, a search and filtering strategy using the PRISMA flow chart is used: (Burhaein et al., 2023; Gazali & Saad, 2023; Simbolon et al., 2023) generated 121 documents. The process of data identification and filtering can be seen in figure 1 below.

Figure 1 Search and filter using PRISMA

To visualize search results, bibliometric analysis, the tool used is VOSviewer (Van Eck & Waltman, 2010), app developed by Van Eck and Waltman affiliated at Leiden University (Burhaein et al., 2023). One of the advantages of using VOSviewer is that it can quickly assess bibliometric data exported from important journal archives, such as Scopus, Web of Science, and PubMed (Y. Jeong et al., 2020). VOSviewer is used to create literature networks (such as keyword cluster analysis, author analysis, and country analysis) and share citation information between literature (such as sharing cited authors and sharing cited literature).

Results and Discussion

Publications Trends

The results of data analysis, from 2012 to 2023, there are 121 research documents that have been published by authors from various countries, with the topic of learning models in physical education. The next analysis was carried out based on the scopus data base with the results showing that in 2012 there were 2 studies, in 2013 there was 1 study, then in 2014 it increased to 4 studies, in 2015 there were 3 studies, in 2016 there were 2 studies, in 2017-2018 there were 3 studies each, in 2019 it increased to 6 researchers, in 2020 it increased to 14 studies, In 2021 and 2022 there

were 27 studies each and in 2023 there were 29 studies, making it the peak of the most published research on the topic of learning models in physical education. Furthermore, the author data with the highest productivity was conveyed. In full can be seen in figure 3, the data shows that among the 10 most productive authors with the topic of learning models in physical education published in the range of 2012 to 2023 with a scopus data base. Goodyear, V.A became the most prolific author by publishing as many as 5 research documents. Furthermore, Yusmiati was in second position by publishing 4 research results. While Casey, Lengkana, Muhtar, Siswantoyo, Supriyadi and Van Der Kamp are next with each author publishing as many as 3 research articles. Alnedral and Ardha each published 2 studies.

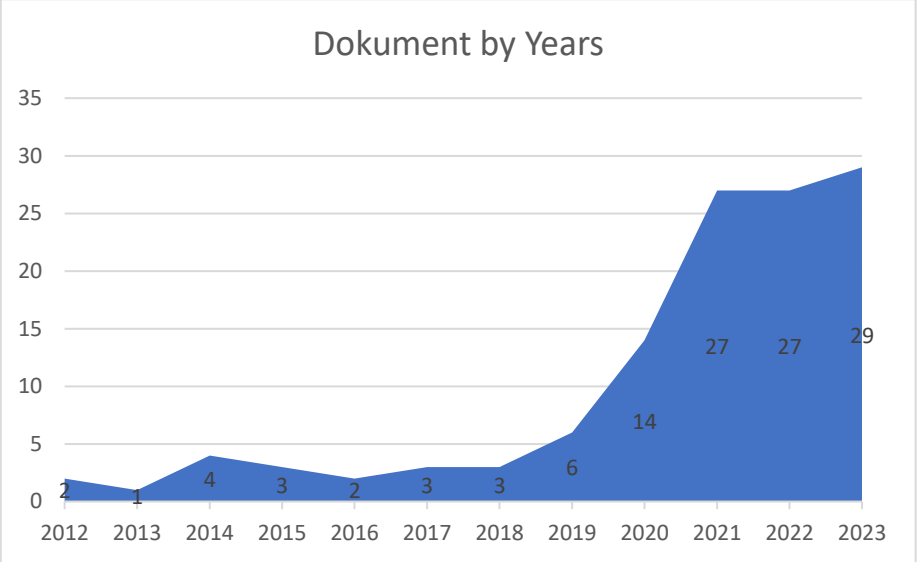


Figure 2 Publication Improvement Trend

Authors and articles with the highest citations

Furthermore, the author data with the highest productivity was conveyed. In full can be seen in figure 3, the data shows that among the 10 most productive authors with the topic of learning models in physical education published in the range of 2012 to 2023 with a scopus data base. Goodyear, V.A became the most prolific author by publishing as many as 5 research documents. Furthermore, Yusmiati was in second position by publishing 4 research results. While Casey, Lengkana, Muhtar, Siswantoyo, Supriyadi and Van Der Kamp are next with each author publishing as many as 3 research articles. Alnedral and Ardha each published 2 studies.

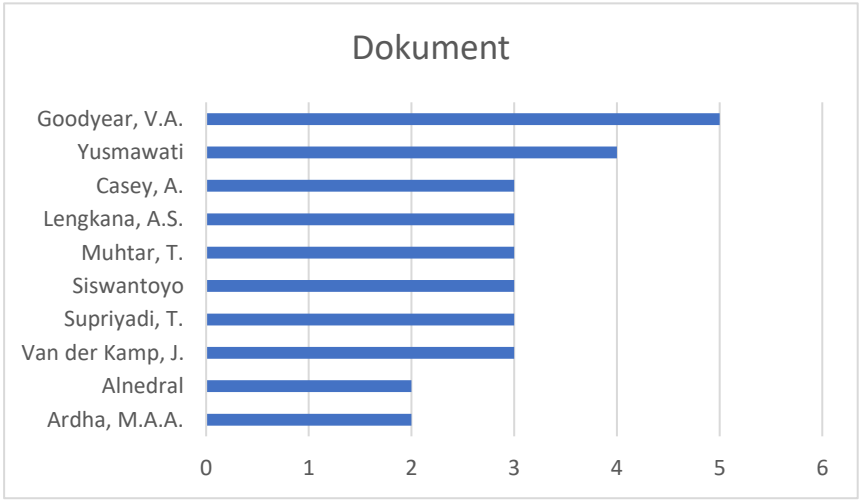


Figure 3. Author productivity in the period 2012 - 2023

In table 1, 10 aticles have the most influential citations on the topic of learning models in physical education. The first position with the highest citations is an article written by Goodyear & Casey (2015) 134 citations. The second most citations of articles written by Bodsworth & Goodyear (2017) 86 citations. The third position of Jeong &So's (2020) 80 citations. The fourth position Goodyear et al (2014) 76 citations. The fifth Kok et al (2020) 51 citations. The sixth Goodyear (2017) 47 citations. The seven Pavlovic et al (2021) 35 citations, eighth Calderón et al (2021) 35 citations. The ninth Cheung & Ng (2021) 30 citations, and the tenth Casey et al (2015) 25 citations. Table 1 below displays the article title, author and the most total citations.

Table 1. Top 10 most influential articles with highest citations

No	Document Title	Authors and Year	Citations Total
1	Innovation with change: developing a community of practice to help teachers move beyond the 'honeymoon' of pedagogical renovation (Goodyear & Casey, 2015)	Goodyear, V.A., Casey, A. 2015	134
2	Barriers and facilitators to using digital technologies in the Cooperative Learning model in physical education (Bodsworth & Goodyear, 2017)	Bodsworth, H., Goodyear, V.A. 2017	86
3	Difficulties of online physical education classes in middle and high school and an efficient operation plan to address them (H.-C. Jeong & So, 2020)	Jeong, H.-C., So, W.-Y. 2020	80
4	Hiding behind the camera: Social learning within the Cooperative Learning Model to engage girls in physical education (Goodyear et al., 2014)	Goodyear, V.A., Casey, A., Kirk, D. 2014	76
5	The effects of self-controlled video feedback on motor learning and self-efficacy in a Physical Education setting: an exploratory study on the shot-put (Kok et al., 2020)	Kok, M., Komen, A., Van Capelleveen, L., Van der Kamp, J. 2020	51
6	Sustained Professional Development on Cooperative Learning: Impact on Six Teachers' Practices and Students' Learning (Goodyear, 2017)	Goodyear, V.A. 2017	47
7	Keeping children healthy during and after COVID-19 pandemic: meeting youth physical activity needs (Pavlovic et al., 2021)	Pavlovic, A., DeFina, L.F., Natale, B.L., Haskell, W.L., Kohl, H.W. 2021	35
8	An integrated blended learning approach for physical education teacher education programmes: teacher educators' and pre-service teachers' experiences (Calderón et al., 2021)	Calderón, A., Scanlon, D., MacPhail, A., Moody, B. 2021	35
9	Application of the Educational Game to Enhance Student Learning (Cheung & Ng, 2021)	Cheung, S.Y., Ng, K.Y. 2021	30
10	Model fidelity and students' responses to an authenticated unit of Cooperative Learning (Casey et al., 2015)	Casey, A., Goodyear, V.A., Dyson, B.P. 2015	25

Figure 4 depicts the total distribution of annual citations related to research on learning models in physical education from 2012 to 2023. The data reveals a clear trend of increasing citations over the years, indicating a growing interest and recognition in this area of study. 2012 (0), 2013 (2), 2014 (2), 2015 (6), 2016 (18), 2017 (34). 2018 (27), 2019 (37), 2020 (58), 2021 (184), 2022 (242), 2023 (342). From this data, it is evident that there has been a significant and steady increase in citations each year, with notable surges in 2020, 2021, and 2022. This upward trend underscores

the increasing importance and influence of research on learning models in physical education. The substantial rise in citations, particularly in the last few years, suggests that this research area is gaining considerable attention and validation within the academic community.

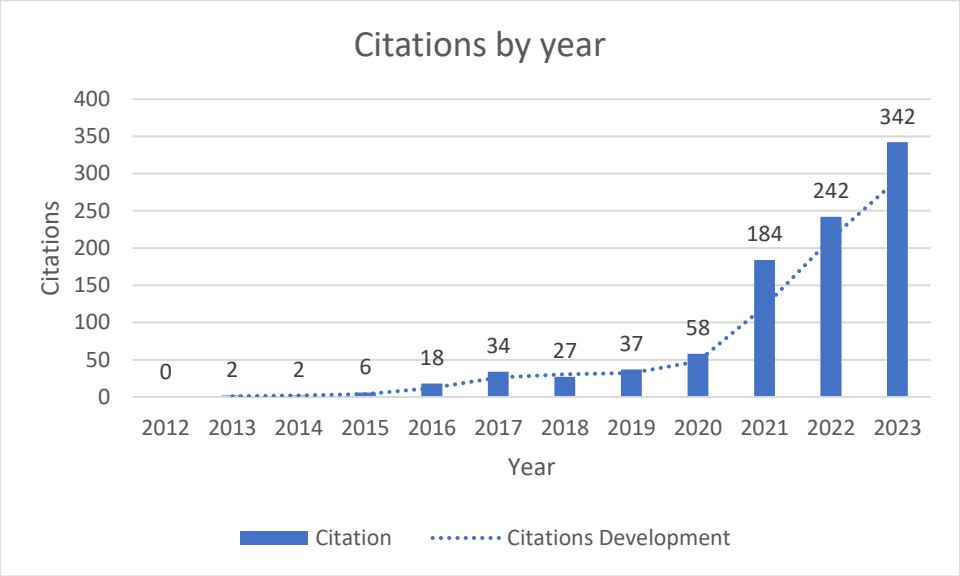


Figure 4 Development of the number of citations

Influential Countries and Publication Cooperation Network

Based on the number of published documents, the following is a complete list of the top 10 countries in table 2. The country that has the most published documents on learning models in physical education is Indonesia with 45 documents. The United Kingdom, China, Spain with 12 publication documents each. South Korea and Brazil have 5 publication documents, Italy has 4 publication documents, Netherland, Taiwan and Greece each with 3 publication documents. In this case, during the 2012-2023 period, Indonesia became the country that conducted the most research publications on the topic of learning models in physical education.

Table 2. Influential Authors Documents generated using VOSviewer

Rank	Country By Documents	Documents	Total link strength
1	Indonesia	45	4
2	United Kingdom	12	10
3	China	12	3
4	Spain	12	3
5	South Korea	5	2
6	Brazil	5	0
7	Italy	4	3
8	Netherland	3	4
9	Taiwan	3	4
10	Greece	3	3

Table 3 presents the top 10 countries ranked by the number of citations to published publications related to learning models in physical education. The data highlights the global distribution of influential research in this field: United Kingdom (422), Indonesia (106), South Korea (94), Spain (88), Netherlands (68), China (62), United States (42), Ireland (35), Hong Kong (29) and New Zealand (25). The United Kingdom leads significantly with the highest number of citations, indicating its prominent role in advancing research on learning models in physical education.

Indonesia and South Korea follow as the second and third most cited countries, respectively. This distribution reflects a diverse international interest and contribution to this research area, with notable participation from both Western and Asian countries.

Table 3. Influential Authors Citation generated using VOSviewer

Rank	Country By Citacion	Citacion	Total link strength
1	United Kingdom	422	10
2	Indonesia	106	4
3	South Korea	94	2
4	Spain	88	3
5	Netherlands	68	4
6	China	62	3
7	United States	42	0
8	Ireland	35	0
9	Hong Kong	29	0
10	New Zealand	25	1

To get a publication collaboration network, the citation feature is used in the VOSviewer application with minimum criteria of 1 document and 1 citation. Figure 6 provides a visual representation of the international collaboration network in research on learning models in physical education. The graph uses node size to indicate the number of articles submitted from each country, lines to represent cooperation between countries, colors to denote different clusters, and the distance between nodes to show the similarity of research topics. Observations from Figure 6 reveal that the network of cooperation is divided into four distinct clusters: Cluster #1: Greece, Italy, Spain; Cluster #2: Belgium, Iran, Netherlands; Cluster #3: Indonesia, Taiwan; Cluster #4: New Zealand, United Kingdom. This clustering highlights regional and thematic collaborations. For instance, Cluster #1 includes Southern European countries, indicating strong regional cooperation. Cluster #2 shows a mix of European and Middle Eastern collaboration, while Cluster #3 connects Southeast Asian countries, and Cluster #4 links countries from the Oceania and Europe. These clusters reflect both geographic proximity and thematic alignment in research interests and methodologies within the field of physical education. The structure of these collaborations emphasizes the importance of international cooperation in advancing research on learning models in physical education.

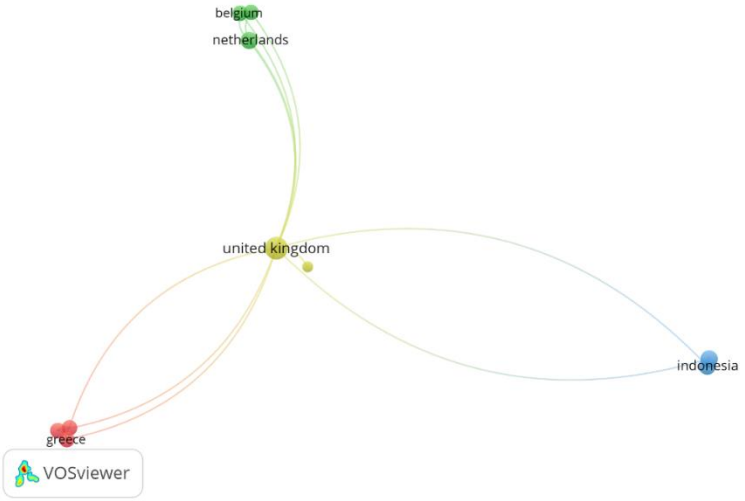


Figure 5 Network visualization between countries

Popular keywords

Keywords provide core information about the content of an article, helping to identify the main topics and themes. When two or more keywords appear together in an article, this phenomenon is referred to as "keyword co-occurrence." Keyword co-occurrence analysis can reveal patterns and relationships between different research topics, indicating how often certain concepts are discussed together and highlighting the interconnectedness of various themes within a field of study. This method is useful for mapping the structure of a research domain and identifying emerging trends and focal points in the literature (Lee & Su, 2010). Keyword co-occurrence analysis is a valuable tool for identifying research hotspots and tracking research trends within a field (Phuong et al., 2023). In this study, keyword co-occurrence analysis was conducted using the shared event function in VOSviewer. This tool employs a fractional counting method, with a minimum threshold set at two occurrences for keywords to be included in the analysis. As a result, 47 keywords were identified and analyzed from the publications. Using VOSviewer, the analysis provided insights into the frequency and relationships between these keywords, helping to map out the research landscape in learning models in physical education. The findings can help identify prominent themes, reveal the interconnectedness of different research topics, and highlight emerging trends and hotspots within the field. The co-occurrence analysis of VOSviewer with the authors keyword analysis unit is further shown in table 4.

Table 4. Top 10 keywords on learning model and physical education

Keyword	Occurrences	Total link strength
Physical education	45	60
Learning model	15	23
Cooperative learning	8	11
Physical activity	7	14
e-learning	5	6
Pedagogy	4	6
Soccer	4	6
Learning	4	5
Motivation	4	5
Motor learning	4	5

The visualization of VOSviewer results on keyword co-occurrence provides a detailed graphical representation of the research landscape. The full details can be seen in figure 6.

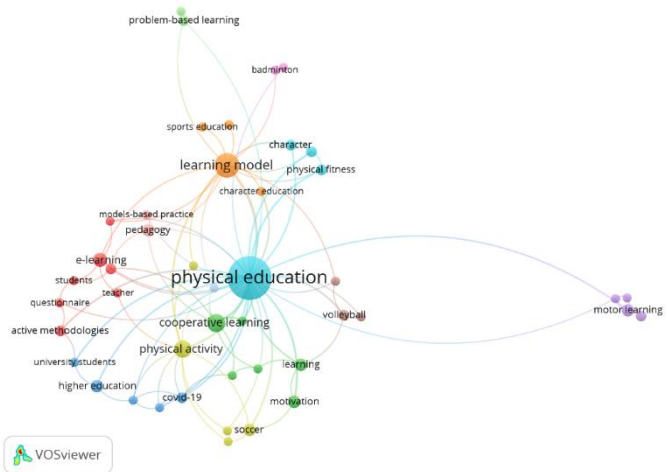


Figure 6 Network of co-occurrences for learning model in physical education

The terms that appeared the most in the analysis of co-occurrence data using VOSviewer showed that the keywords that appeared the most were physical education (45), learning model (15), cooperative learning (8), physical activity (7), e-learning (5), pedagogy (4), soccer (4), learning (4), motivation (4), and motor learning (7). Next, each keyword is grouped in clusters and shown in table 5.

Table 5 Keyword analysis by cluster

Cluster	Items	Colour	Percentage	Total
C1	Active methodologies, creativity, e-learning, questionnaire, students, teacher, technology	red	16%	7
C2	Cooperative learning, instrinsic motivation, learning, motivation, physical education students, tolerance	green	13%	6
C3	Covid-19, higher education, online teaching, sport pedagogy, university students	Blue	11%	5
C4	children, cognition, nonlinear pedagogy, physical activity, soccer	yellow	11%	5
C5	Blanded learning, modeling, motor learning, self-eficacy	purple	9%	4
C6	Character, critical thinking, physical education, physical fitness	Light Blue	9%	4
C7	Character education, learning model, sports education, traditional games	Orange	9%	4
C8	Motor skills, tgfu, volleyball	chocolate	7%	3
C9	Badminton, learning environment	Pink	4%	2
C10	Models-based practice, pedagogy	Peach	4%	2
C11	Flipped classroom, problem-based learning	Light green	4%	2
C12	dance	Navy	2%	1
Total			100%	45

Grouping keywords based on clusters, shows that there are 45 keywords that are interconnected and then divided into 12 clusters. Each cluster has a direct keyword connection. The keywords that appear in each cluster are trends that often appear in the publication of learning models and physical education, so they can be taken into consideration to become current research issues that get a lot of attention. Specifically, the learning models that emerged include cooperative learning, blanded learning, sport education, traditional games, tgfu, models-based practice, flipped classroom, and problem-based learning.

In the field of physical education, various teaching methods and approaches are constantly evolving to enhance students' learning experience. Models that focus on active student engagement, collaboration, and critical thinking provide opportunities for students to actively participate in learning and develop important skills such as teamwork, communication, problem-solving, and decision-making (Miletic et al., 2023; Samosir et al., 2023). The model also encourages inclusivity and creates a supportive learning environment where students feel empowered and motivated to reach their full potential. The use of appropriate learning models and learning media in physical education can provide a better learning experience for students (Triansyah et al., 2023).

In an era of rapid technological development, the learning model through games is becoming increasingly relevant. This is due to the strong influence of games as an engaging and interactive educational resource for students. Research results (Fizi et al., 2023) The game-based

learning model is effective in improving motor skills, cooperation and discipline in upper grade elementary school students. So that further researchers are advised to conduct further studies and development of game-based learning models that encourage the physical education learning process in accordance with the applicable curriculum.

Applying problem-based education (PBL) models to the development of sustainable sports education is an interesting topic to study. Research results (Jang, 2023) with the title analysis of the problem-based learning model's application for the sustainable development of sports education. Recommends the application of the PBL model in sports education because it can improve various important aspects such as problem solving, communication, teamwork, and confidence. From the bibliometric analysis of the learning model delivered in the results and discussion, it can be used as a reference for researchers in the future, because it is following the development and attention of international researchers.

Conclusion

This study aims to conduct a bibliometric analysis of articles related to learning models in physical education, focusing on publications from the Scopus database between 2012 and 2023. The analysis reveals a clear trend of increasing publication activity in this domain over the specified period. Goodyear, V.A became the most prolific author by publishing as many as 5 research documents. The influential researcher with the most citations was written by Goodyear & Casey in 2015 (134 citations), the title of the article Innovation with change: developing a community of practice to help teachers move beyond the 'honeymoon' of pedagogical renovation. During the period 2012-2023, Indonesia became the country that has conducted the most research publications on the topic of learning models in physical education. While the country with the most citations is the United Kingdom with a total of 422 citations. The keywords that appear most in search analysis are physical education, learning model, cooperative learning, physical activity, e-learning, pedagogy, soccer, learning, motivation, and motor learning. Furthermore, keywords that are specifically related to the learning model that emerged were searched include cooperative learning, blanded learning, sport education, traditional games, tgfu, models-based practice, flipped classroom, and problem-based learning. By examining the topics that have been extensively discussed as well as those that have not received much attention from academics, the findings of this bibliometric mapping can serve as a valuable reference. This analysis provides essential insights for future researchers aiming to illuminate the background or address broader issues related to learning models in physical education.

This study also has several limitations. It primarily focuses on describing the dynamic trends of learning models in physical education from a bibliometric perspective. To provide a more comprehensive understanding, future research could consider employing other types of reviews. In addition, further researchers can also conduct further examinations of the impact of learning models in physical education by conducting comparative or influence studies, so as to make research information clearer in the future. Through this research, we hope to help the development and research of physical education.

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