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Beden Eğitimi Öğretmen Adayları Üzerine En Çok Atıf Yapılan Çalışmaların Bibliyometrik ve Sistematik Analizi

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Özet

Bu çalışmanın amacı, beden eğitimi öğretmen adayları üzerine en çok atıf alan makaleleri sistematik derleme ve bibliyometrik analiz yoluyla belirlemek ve analiz etmek, araştırma eğilimlerini ortaya koymak ve öğretmen eğitimi literatürüne katkı sağlamaktır. Web of Science veri tabanında indekslenen çalışmalar incelenerek en üretken yazarlar, dergiler, ülkeler ve anahtar kelimeler belirlenmiştir. Tematik yönelimler, metodolojik özellikler ve eğitsel etkiler sistematik olarak değerlendirilmiştir. Bulgular, 2010 yılından sonra öğretmen adayları ile ilgili yayınlarda önemli bir artış olduğunu göstermektedir. Chiva-Bartoll, Dervent ve Block en önde gelen yazarlar olarak belirlenmiş, Journal of Teaching in Physical Education ise en önde gelen dergi olarak öne çıkmıştır. Amerika Birleşik Devletleri, İspanya, Avustralya ve Birleşik Krallık, ülke düzeyindeki kurum bağlantısı sıklıkları açısından en yüksek değerlere sahip ülkeler olarak belirlenmiştir. Sık kullanılan anahtar kelimeler arasında algılar, inançlar, pedagojik alan bilgisi, tutumlar, kapsayıcılık ve deneyimler yer almakta olup, cinsiyet, çeşitlilik ve geçerlik temalarının tematik yapı içerisinde sınırlı bir gelişim gösterdiği belirlenmiştir. Elde edilen bulgular, incelenen en çok atıf alan 50 çalışma içerisinde 2010 sonrasında yayın sıklığının arttığını ortaya koymakta ve gelecekteki çalışmalar için cinsiyet, çeşitlilik ve geçerlik konularına daha fazla odaklanılması gerektiğini vurgulamaktadır.

Anahtar kelimeler: *Beden Eğitimi Öğretmen Adayları, Bibliyometrik Analiz, Sistematik Derleme, Pedagojik Yeterlilik*

A Bibliometric and Systematic Analysis of the Most-Cited Studies on Pre-Service Physical Education Teachers

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Abstract

This study aimed to identify and analyze the most cited articles on PETE (Physical Education Teacher Education) students through a systematic review and bibliometric analysis, revealing research trends and contributing to the teacher education literature. Studies indexed in the Web of Science database were examined to determine the most productive authors, journals, countries, and keywords. Thematic orientations, methodological characteristics, and educational implications were systematically assessed. Results indicated a notable increase in PETE-related publications after 2010. Chiva-Bartoll, Dervent, and Block were identified as leading authors, while the Journal of Teaching in Physical Education was the most prominent journal. The United States, Spain, Australia, and the United Kingdom showed the highest country-level affiliation frequencies. Frequently used keywords include perceptions, beliefs, pedagogical content knowledge, attitudes, inclusion, and experiences; however, the themes of gender, diversity, and validity show relatively limited development within the thematic structure. The findings reveal an increase in publication frequency after 2010 among the 50 most-cited studies examined and emphasize the need for future research to focus more on issues of gender, diversity, and validity.

Keywords: *Pre-Service Physical Education Teachers, Bibliometric Analysis, Systematic Review, Pedagogical Competence*

Introduction

The practical implementation of physical education classes depends on the role of physical education and sports teachers in the teaching process. Physical education and sports teachers play a significant role in the teaching and learning processes, and can have a direct impact on students' lives (Goodyear & Dudley, 2015). Teachers provide students with fundamental sports knowledge and support their social development, thereby improving their health and physical activity levels (Su & Liu, 2025; Zhang et al., 2012). Therefore, physical education teacher education (PETE) students with appropriate curricula, effective teaching methods, accurate assessment approaches, and hands-on experiences can contribute to students leading healthy and active lives in the future (Barney et al., 2012).

However, the education of PETE students must meet increasingly complex educational demands. Young people today are increasingly sedentary (Park et al., 2020), and PETE students are increasingly responsible for instilling physical activity habits through physical education classes (Centeio et al., 2023). Research reveals that the effectiveness of these preservice teachers is primarily determined by the training they receive, their self-confidence, and their level of preparation in physical education teaching (Spittle et al., 2022). Furthermore, preservice teachers' past experiences in physical education classes have a significant impact on their teaching beliefs and practices (Hand, 2014; Randall & Maeda, 2010). Moreover, the integration of technology in physical education teaching can facilitate more meaningful interactions with students by enhancing the pedagogical competence, self-efficacy, and overall learning outcomes of PETE students (Semiz & İnce, 2012).

PETE students' professional development is not limited to pedagogical competencies and technology integration. The quality and methodological diversity of academic research conducted in the field also contribute to the expansion of knowledge on the preparation of preservice teachers (Kuzembayeva et al., 2025; Langelaan et al., 2024). Recent studies have increased the diversity of the literature with experimental designs evaluating the effectiveness of curricula (Grimminger-Seidensticker & Seyda, 2022), qualitative studies revealing the experiences and beliefs of preservice teachers (McMahon & MacPhail, 2007), and mixed-method approaches examining the effects of innovative tools on learning processes (Calderón et al., 2021). The findings of these studies can offer important implications for improving the teaching skills of PETE students, increasing their professional motivation, and enhancing their capacity to adapt to diverse learning environments.

In addition, due to its significance in the educational process of PETE students, various research designs in the field incorporate bibliometric analyses, which reveal existing knowledge networks, and systematic reviews, which facilitate the synthesis of the literature. By examining the relationships among academic publications, researchers, and institutions through quantitative methods, bibliometrics can visualize citation and co-citation networks, as well as author collaborations, thereby providing a comprehensive perspective on the most influential studies and emerging research trends in the field (Donthu et al., 2021). Moreover, it can guide future research by identifying potential gaps in the literature (Ellegaard & Wallin, 2015; Passas, 2024). Combining bibliometric analyses with systematic reviews allows for a thorough assessment of both qualitative and quantitative research evidence, further elucidating research

trends (Chemnad & Othman, 2024; Huang et al., 2020). Recently, researchers have employed bibliometric analysis to examine the scientific structure of research on physical education teacher education (PETE) and to identify trends and gaps in the field (Yanar Tunçel & Avşar, 2023; Zhou, 2024).

Although bibliometric analyses and systematic reviews have been conducted on this subject, these studies exhibit certain technical and methodological limitations. Technically, the researchers have noted that the scope of sources used, the limited focus areas, and the dynamic nature of the field restrict the generalizability of the results (Zhou, 2024). They also indicated that constraints related to time and page limits hinder in-depth examination of some topics (Zhou, 2024). Another limitation concerns the study selection criteria. While Yanar Tunçel and Avşar (2023) included all article types (review, conceptual, empirical), Zhou (2024) applied specific exclusion criteria. This variation in article types can introduce bias in assessing scientific impact, especially since review articles tend to receive more citations (Miranda & Garcia-Carpintero, 2018). Additionally, limitations arise from search strategies and keyword selection. Zhou (2024) searched for variations of the phrase physical education teacher without using quotation marks; in contrast, Yanar Tunçel & Avşar (2023) restricted their search to the term teacher education. The absence of quotation marks and the limited range of keyword combinations may result in the exclusion of relevant studies or the inclusion of irrelevant publications in the analysis (Bramer et al., 2018; Linder et al., 2015). Employing a broader array of keyword combinations could yield more comprehensive results in the field of PETE.

Researchers state that due to the limitations of keywords observed in previous studies and the shortcomings stemming from the diversity of included studies, future bibliometric analyses should be conducted with more diverse keyword combinations and supported by more comprehensive studies focusing on technology integration, inclusiveness, and the professional competencies of preservice teachers (Yanar Tunçel & Avşar, 2023; Zhou, 2024). However, while existing research provides an overview of the literature on physical education teacher education and preservice teachers, it is limited in terms of the scope of the publications examined and the criteria used. Therefore, the current study addresses these limitations by conducting a bibliometric analysis and systematic review of the 50 most-cited studies focusing on pre-service physical education and sport teachers.

It provides an evidence-based overview of the most-cited studies shaping pre-service teacher education in physical education. It critically examines how research productivity, collaboration, and thematic focus have evolved across countries and journals. It identifies themes that show differing levels of development, including gender, diversity, and validation, thereby highlighting potential directions for future research. In doing so, the current study combines quantitative bibliometric evidence with pedagogical interpretation to make a meaningful contribution to the research methodology and teacher education practices in the global field of physical education.

The primary objective of this study was to conduct a bibliometric analysis and systematic review of the 50 most cited research articles on PETE students indexed in the Web of Science (WoS). The research questions addressed were: (i) What are the subject areas, researchers,

journals, and country affiliations of the 50 most cited articles on this topic? (ii) What are the characteristics of the included studies?

Materials and Methods

Study Protocol Registration

This study design adhered to the BIBLIO guidelines for the bibliometric analysis process (Montazeri et al., 2023), while the Synthesis Without Meta-analysis (SWiM) guidelines were applied to the systematic review process (Campbell et al., 2020). The study protocol was registered with the Open Science Framework (OSF) (DOI: https://doi.org/10.17605/OSF.IO/8ZGHU). Study documents were submitted through OSF, and details of the BIBLIO and PRISMA checklists are presented in Appendix 1 and Appendix 2.

Electronic Database Search and Strategy

A systematic search was conducted in the Web of Science (WoS) database on September 16, 2025, to identify studies on PETE students. The keywords were combined using the Boolean operator "OR" to construct the search strategy: "Prospective Physical Education Teachers," "Aspiring Physical Education Teachers," "Future Physical Education Teachers," "Candidate Physical Education Teachers," "Trainee Physical Education Teachers," "Physical Education Teacher Candidates," "Physical Education Teachers in Training," "Would-Be Physical Education Teachers," "Emerging Physical Education Teachers," "Physical Education Teacher Aspirants," "Practices in Physical Education Teacher Education," "Physical Education Teachers," "Preservice Physical Education Teacher," "Pre-Service Physical Education Teacher," "Candidate of Physical Education Teachers," "Preservice of Physical Education Teachers," "Pre-service of Physical Education Teachers," "Future of Physical Education Teachers," "Trainee of Physical Education Teachers," and "Education of Preservice Physical Education Teachers."

The search yielded 602 records. The retrieved records were ranked in descending order according to their total citation counts reported in WoS. Two independent researchers screened the titles and abstracts of the ranked records according to the predefined inclusion criteria. The first 50 most-cited articles that met all inclusion criteria were included in the systematic review and bibliometric analysis.

Eligibility Criteria

Participants, intervention, comparators, outcomes, and study design (PICOS) criteria were used to identify studies for inclusion in the bibliometric analysis and systematic review. Details regarding these criteria are presented in Table 1.

Table 1. Study Inclusion and Exclusion Criteria based on PICOS.

	Inclusion criteria	Exclusion criteria
Population	Pre-service physical education and sport teachers without any gender or sociocultural restrictions	Teacher candidates other than physical education and sport teachers
Intervention	Studies employing any type of intervention or research method involving pre-service teachers as the population	Purely theoretical studies that do not include any intervention or analysis of a specific variable
Comparator	Studies comparing pre-service physical education and sport teachers using different scientific research techniques	NA
Outcome	Studies reporting outcomes for any dependent variable related to pre-service physical education and sport teachers	Studies that do not report outcome variables
Study design	Experimental, descriptive-correlational, prospective, and case-report studies	Reviews, books, conference proceedings, and studies without full text
Additional criteria	Peer-reviewed English-language articles among the top 50 most-cited studies in the field	Non–peer-reviewed studies, articles not included among the top 50 most-cited papers in the field, and non-English publications

Data Extraction

The data extraction form was adapted from the electronic form in the Cochrane Handbook. The following data were extracted from included studies: (i) study characteristics (authors, year of publication, and study design), (ii) participant characteristics, (iii) research method, data collection tools, and statistical techniques used, (iv) study findings, and (v) WoS information for the study. Two independent researchers performed data extraction. In cases of disagreement between researchers, a third researcher was involved.

Data Integrity Assessment

Data integrity was assessed by examining potential information loss during the transfer of data from WoS to bibliometrix. The information loss rate was evaluated using the Bibliometrix package in R.

Statistical Analysis

In this study, a search was conducted in the WoS database using predetermined criteria and keywords to conduct bibliometric analyses. The 50 most cited articles were selected from among the obtained studies and downloaded in BibTeX format. Data analysis was performed using the R program (version 4.2.1). The {bibliometrix} package and its web-based user

interface, Biblioshiny, were used for bibliometric analyses. Biblioshiny, developed on the Shiny package in R, enables interactive analysis and visualization of bibliometric data (Aria & Cuccurullo, 2017). Using Biblioshiny, the bibliometric analyses included annual scientific production, citation analysis, author productivity and collaboration networks, institutional and country scientific production, and source productivity. Keyword-based analyses included co-occurrence networks, density visualization, word-cloud analysis, and thematic mapping. The thematic map was interpreted according to the centrality and density of the identified themes.

Results

Results for Systematic Review

Eligibility assessment

Using the specified keywords, only articles published in English were searched. To be included in the review, studies were subject to the following criteria: a participant group of prospective physical education and sports teachers, reporting a dependent variable, publication in peer-reviewed journals, and availability of the full text. Exclusion criteria included reviews, books, conference proceedings, publications in languages other than English, and studies that did not report outcome variables. A total of 602 records were retrieved from the electronic data search. Based on these exclusion criteria, 552 studies were excluded, and the 50 most cited articles were included in the systematic review and bibliometric analysis. Details of the PRISMA flow diagram for the study are presented in Figure 1.

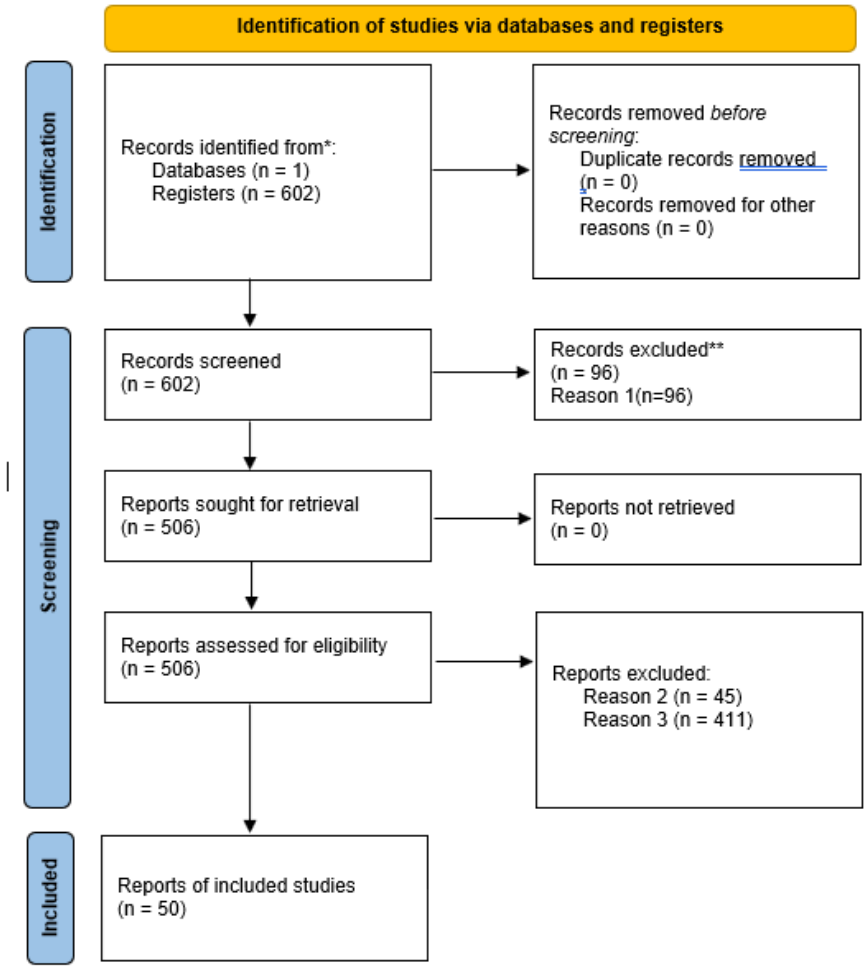


Figure 1. Flow Diagram for the Screening Process of the Study

Legend. Reason 1: Excluded review, book, etc. Reason 2: studies not reported in English; Reason 3: Studies not included in the 50 most cited articles on the subject.

Characteristics of the Included Studies

For this systematic review, the methodological distribution of 50 articles was analyzed. Twenty-eight (56%) of the studies employed qualitative research methods, while 16 (32%) used quantitative methods. Additionally, six (12%) of the studies utilized mixed methods. The most commonly used designs in quantitative studies were descriptive surveys and quasi-experimental models. In qualitative studies, various approaches were employed, including narrative research, action research, ethnography, and grounded theory, with a particular emphasis on case studies. Studies using mixed methods typically analyzed both quantitative data (such as surveys and scales) and qualitative data (including reflective journals and interviews) concurrently.

When evaluating the participant profiles of the top 50 studies, the groups included both male and female participants. Female participants were particularly prominent in topics such as cultural competence and social-emotional learning. Sample sizes varied according to the research method: qualitative studies typically employed small, in-depth samples, whereas quantitative studies used larger, more representative samples. Regarding data collection tools,

surveys and scales were generally favored in quantitative research. Conversely, qualitative studies utilized methods such as semi-structured interviews, reflective journals, observation forms, and portfolio analyses. For data analysis, quantitative studies commonly applied statistical tests (t-tests, ANOVA, regression) and effect size calculations, while qualitative studies employed approaches such as content analysis, thematic analysis, and grounded theory. The dependent variables examined included cultural competence, professional readiness, self-efficacy, reflective thinking, technology integration (TPACK), and social-emotional development. Overall, student-centered, practice-based models were generally associated with positive outcomes in the pedagogical development of preservice teachers. Detailed study characteristics are provided in the supplementary materials available through the OSF repository (https://osf.io/wxc8a).

Results for Bibliometric Analysis

The top 50 most cited articles on PETE students were published between 1990 and 2021. The annual growth rate was 5.33%, and the average age of the documents was 11.8 years. The average number of citations per article was calculated as 37.72. The documents used 149 Keywords Plus and 152 author keywords. A total of 144 authors contributed to the studies, with an average of 3.22 authors per article. Only eight studies were published by a single author, and the international co-authorship rate was determined to be 22%. All the documents examined were categorized as articles, and the most cited publications were published in 20 different journals.

When annual scientific production data on the subject were evaluated based on the 50 most cited articles, it was determined that the first publication was published in 1990, and that production in subsequent years, primarily until the mid-2000s, exhibited an irregular and low-level trend. The number of publications began to increase in 2008, continuing with two publications per year between 2010 and 2012. The most notable increase occurred in 2014, and the number of publications reached its highest level with five publications after this year (2015, 2017, 2020, and 2021). Four publications were produced in 2016, while production remained limited to two publications in 2018 and 2019. Within the 50 most-cited articles examined, publication frequency increased after 2010, particularly after 2014. Details on basic information on the subject are presented in Figure 2a, while details on annual scientific production rates are presented in Figure 2b.

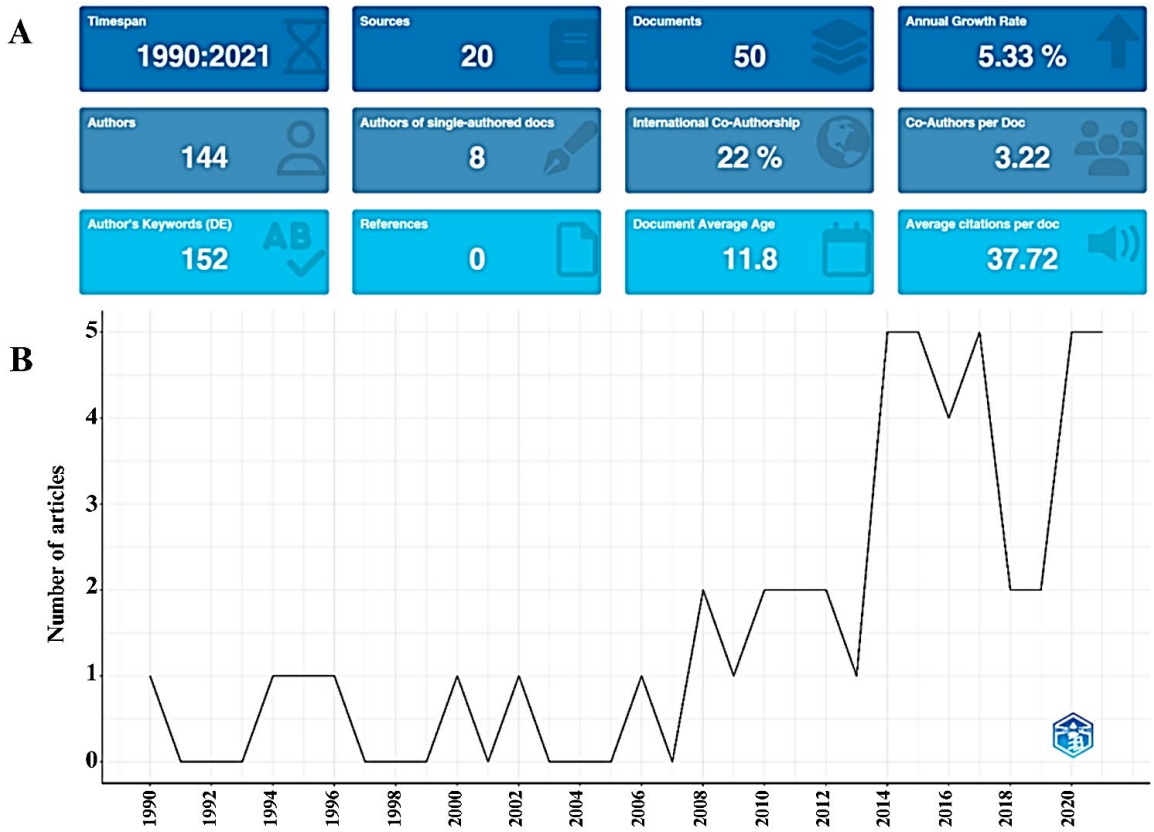


Figure 2. Main information for Data and Annual Scientific Production Rates

Legend. A: Main information; B: Annual scientific production rates for subject

Figure 3, derived from the top 50 most cited studies on PETE students, presents prominent concepts in the literature and their relational contexts. The central concepts of perceptions and beliefs were found to be the most frequently used and strongly correlated keywords in the literature. Perceptions are linked to "occupational socialization," "pedagogical content knowledge," "experiences," "delivery," and "perspective," emphasizing the professional development processes, pedagogical knowledge base, and experience dimensions of preservice teachers. Conversely, beliefs, linked to "attitudes" and "inclusion," focus on attitudes and the concept of inclusive education. More peripherally, the concepts of "impact," "program," and "preservice teacher" refer to practice- and program-based research. At the same time, "scale" and "validity" represent measurement and evaluation studies, and "children," "disabilities," and "individuals" represent research focusing on individuals with special needs. Additionally, the concepts of "gender" and "intersectionality" were identified as prominent research topics within the fields of gender and intersectional studies. Details regarding the co-occurrence network are presented in Figure 3a.

When assessing the findings regarding co-occurrence network density, color density indicates the level of academic interest in specific keywords. Darker and more intense colors indicate areas with a higher concentration of co-occurring keywords. The findings suggest that the most intense colors are concentrated in the concepts of perceptions and beliefs, with the terms perspective, occupational socialization, and pedagogical content knowledge located near these concepts. Details regarding the co-occurrence network density are presented in Figure 3b.

Finally, a word cloud was generated for the keyword co-occurrence, density, and frequency map. Central terms such as "pedagogical content knowledge," "perceptions," "beliefs," "program," "students," and "attitudes" indicated that the 50 most cited studies focused on preservice teachers' pedagogical knowledge base, perceptions, beliefs, curriculum, and student attitudes. Furthermore, the prominence of concepts such as "students," "children," "delivery," "diversity," "experiences," "fitness," and "impact" in the literature revealed that the research encompassed a variety of dimensions, including student experiences, diversity management, the transfer of teaching processes, physical fitness, and the impact of the programs. This diversity demonstrated that the 50 most cited studies spanned a broad spectrum, from pedagogical content knowledge to student-centered practices. Details of the word cloud are presented in Figure 3c.

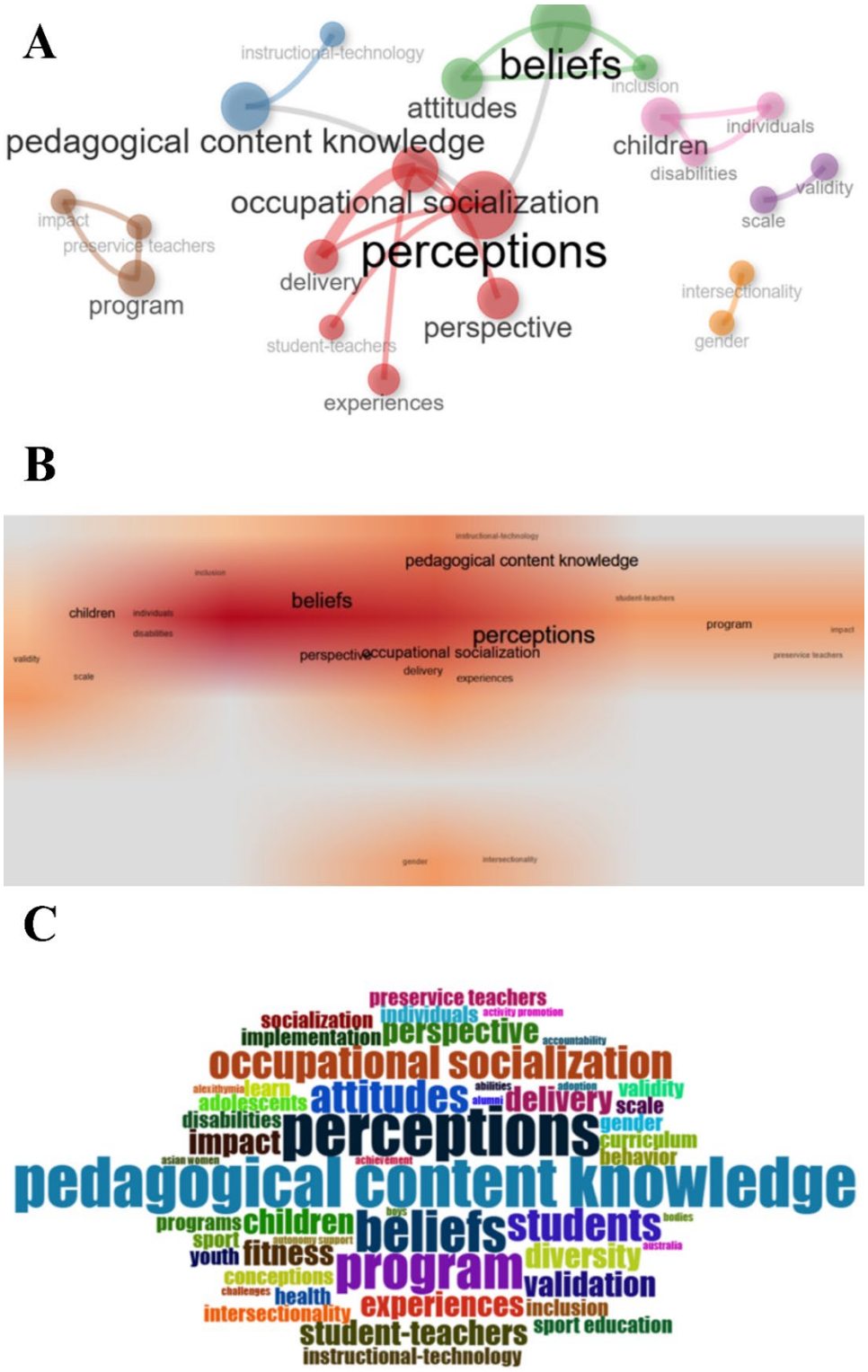


Figure 3. Keyword Co-Occurrence, Density and Frequency Map

Legend. A: Co-occurrence network; B: Co-occurrence network density; C: Word cloud.

The research trends of the 50 most cited studies on the topic were assessed using a thematic map. Findings showed that among the motor themes, the clusters of attitudes, children, experiences with disabilities, behavior, and sport, with high centrality and density values, represent well-developed and central themes within the 50 most-cited PETE studies.

In contrast, the clusters of students, validation, and adolescents, which were among the core themes, had low density despite their high centrality. These results revealed that these themes, while important in the literature, have not been sufficiently explored in depth. The niche themes of diversity, gender, intersectionality, and health and instructional-technology clusters were extensively studied but had limited relevance to the field as a whole. On the other hand, the clusters of pedagogical content, knowledge, student-teachers, conceptions, and programs, with their low centrality and density, represented emerging or declining themes. Finally, the concepts of program, fitness, and impact were positioned near the center of the thematic map. At the same time, the clusters of perceptions, beliefs, and occupational socialization exhibited relatively high centrality but moderate density, indicating their relevance to the research field. A detailed thematic map is presented in Figure 4.

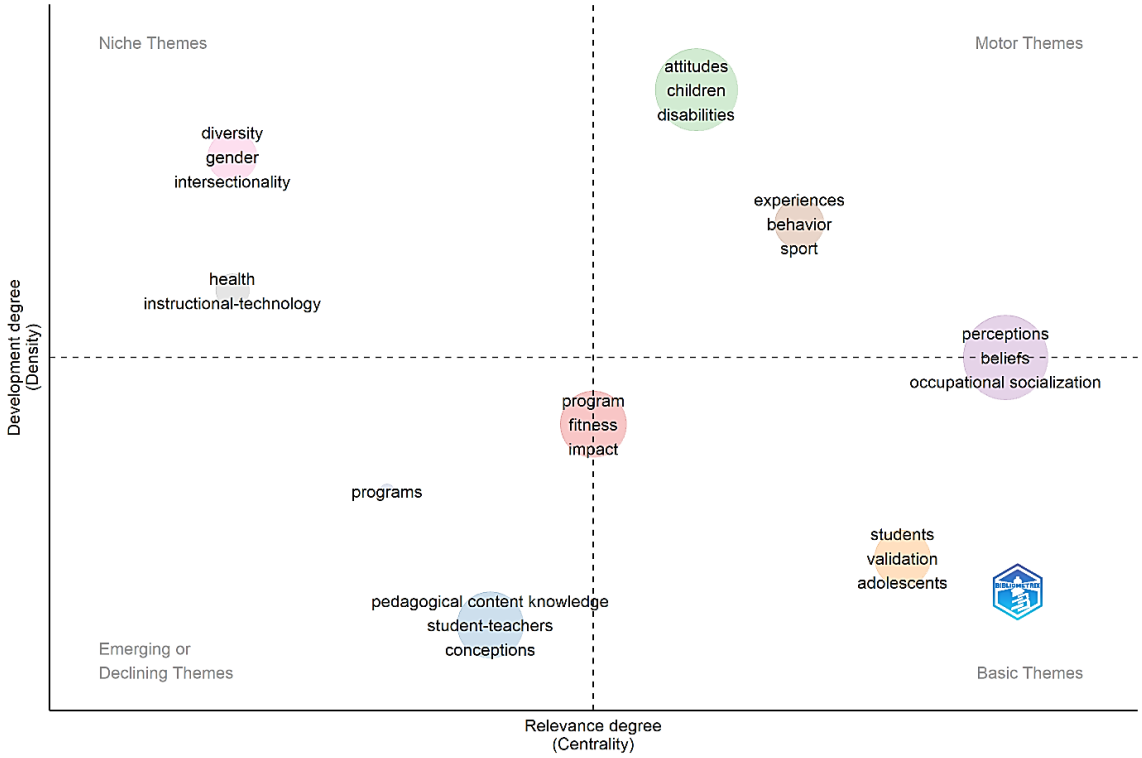


Figure 4. Thematic Map of Research Themes in The Top 50 Most-Cited Studies on Pre-Service Physical Education Teachers

The results of the author distribution among the top 50 most-cited articles on PETE students revealed that the most productive researchers were Chiva-Bartoll Oscar and Dervent Fatih. Flintoff Anne, Herold Frank, Block Martin E., Davids Keith, and İnce Mustafa Levent each followed with two publications. Details on the most productive authors are presented in Figure 5a.

An evaluation of authors' research publication rates by year revealed that the authors who published most on PETE students stood out in different periods. Chiva-Bartoll Oscar achieved the highest production with three publications in 2020 (Chiva-Bartoll, Capella-Peris, et al., 2020; Chiva-Bartoll, Montero, et al., 2020; Ruiz-Montero et al., 2020). Similarly, Dervent Fatih produced one publication in three different years (2015, 2018, and 2020) (Dervent, 2015;

Dervent et al., 2018, 2020). Other authors continued to publish between 2013 and 2021. This distribution reveals that productivity among the 50 most cited studies is concentrated around certain researchers, but continuity in the literature is maintained through contributions from different authors in different years. Details on authors' production rates by year are presented in Figure 5b.

The results for the author collaboration network revealed that the authors with the largest collaboration networks were Chiva-Bartoll Oscar, Celina, and Capella-París. Other authors contributed to the literature in smaller clusters. Overall, the collaboration network demonstrated strong collaborations centered around specific central authors, highlighting limited interaction between the groups. Details of the author collaboration network are presented in Figure 5c.

Citation rates were compared among the 50 most cited articles on the topic, and the study by Demchenko et al. (2021), published in the journal Brain-Broad Research in Artificial Intelligence and Neuroscience, had the highest number of citations, at 123. The study evaluated the professional preparation of preservice teachers in inclusive education settings. Studies by Domangue & Carson (2008), which are prominent in the context of service-learning, and Tsangaridou & O'Sullivan (1994), which focused on reflective pedagogical strategies, published in the Journal of Teaching in Physical Education, received 82 and 69 citations, respectively. Similarly, the study by García-Rico et al., which addressed service-learning for sustainable development goals, published in the International Journal of Sustainability in Higher Education, and the study by Moy, Renshaw, and Davids, which examined the effect of non-linear pedagogy on the motivation of prospective teachers, published in the journal Physical Education and Sport Pedagogy, stood out with 67 citations (García-Rico et al., 2021; Moy et al., 2016).

A study by Block and colleagues, which developed a self-efficacy measurement tool for inclusive education and was published in Adapted Physical Activity Quarterly, contributed to the field with 64 citations. In contrast, a study by Semiz & İnce, which focused on technological pedagogical content knowledge, published in the Australasian Journal of Educational Technology, offered methodological contributions with 56 citations (Block et al., 2013; Semiz & İnce, 2012). Additionally, a study by Mordal-Moen and Green, which explored the perception of pre-service teachers, published in Sport Education and Society, received 55 citations (Mordal-Moen & Green, 2014), and a study by Galvan and Parker, which discussed the reciprocal nature of service-learning, published in the Journal of Experiential Education, stood out in the literature with 51 citations (Galvan & Parker, 2011). Earlier, Curtner-Smith's pioneering research, published in the Journal of Teaching in Physical Education, highlighted the impact of early field experience on teachers' understanding of teaching with 47 citations (Curtner-Smith, 1996). Details on the most cited studies on PETE students are presented in Figure 5d.



Figure 5. Authorship Patterns and Research Impact in the Top 50 Most-Cited Studies

Legend. A: Most relevant Authors; B: Authors production over time; C: Authors' collaboration network; D: Most-cited articles.

Research on PETE students examined the productivity levels of institutions, and it was determined that the most influential research on the topic was conducted at Marmara University and Queensland University of Technology, each with six articles. These two institutions were followed by the University of Limerick, which had five articles. Leeds Metropolitan University, Ohio State University, the University of Birmingham, the University of Loughborough, the University of Queensland, and the University of Valladolid each contributed four articles. Pavlo Tychyna Uman State Pedagogical University was also included in the list with three articles. Details of the universities producing the most influential studies are presented in Figure 6a.

The country-level distribution of the top 50 most-cited articles was evaluated using affiliation-country frequencies from the bibliometric analysis. The highest frequencies were observed for the United States (n = 51), Spain (n = 27), Australia (n = 21), and the United Kingdom (n = 21), followed by Ukraine (n = 18) and Turkey (n = 15). Lower frequencies were observed for Ireland (n = 6), Belgium (n = 3), Canada (n = 2), Norway (n = 2), and South Korea (n = 2), while China, Finland, Israel, and Latvia each had a frequency of one. These frequencies represent country-level affiliation data derived from author affiliation information, as a single article may include authors affiliated with institutions in multiple countries. Details of the country-level scientific production within the 50 most-cited articles are presented in Figure 6b.

The majority of the top 50 most cited articles were published in the Journal of Teaching in Physical Education (n = 11), Physical Education and Sport Pedagogy (n = 8), European Physical Education Review (n = 6), and Sport Education and Society (n = 6). These four journals, with a total of 31 articles, accounted for more than half of the articles in the dataset. Details on the journals that publish the most articles in the dataset are presented in Figure 6c.

The publication frequency of the 50 most-cited articles increased after 2010. The Journal of Teaching in Physical Education showed consistent contributions over time and had the highest number of articles among the journals represented in the dataset. Physical Education and Sport Pedagogy gained visibility after 2014, while the European Physical Education Review and Sport Education and Society have maintained regular production since 2015. This trend indicates that field-specific journals have become the primary publication platforms for research in physical education and sport pedagogy over the past decade. Journal publication trends are presented in Figure 6d.

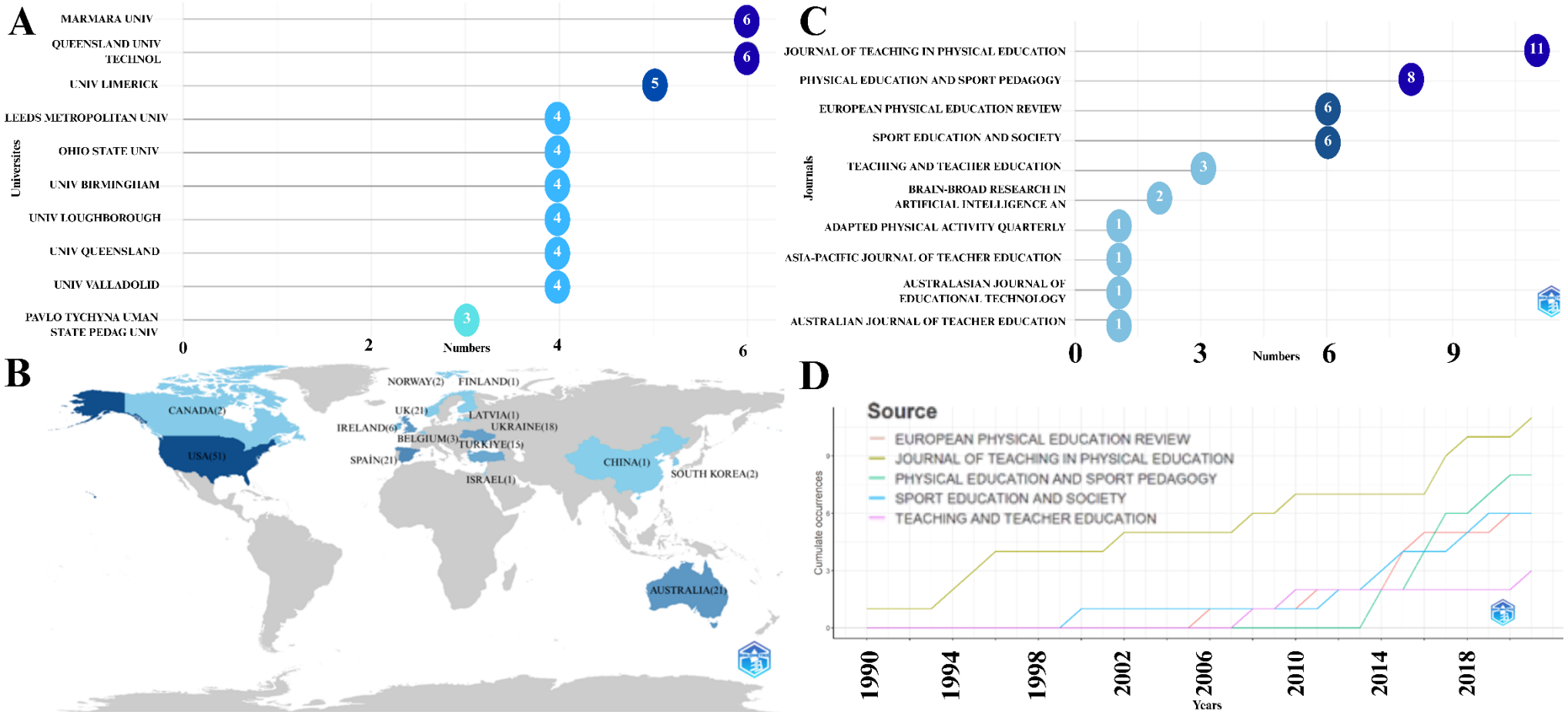


Figure 6. Scientific Production by Affiliations, Countries, and Sources

Legend. A: Most relevant affiliations; B: Country scientific production; C: Most relevant sources; D: Sources production over time

Discussion, Conclusion and Recommendations

This study aimed to analyze the 50 most-cited articles on PETE students using bibliometric and systematic methods to identify the direction of scientific impact and thematic trends. The results showed that topics such as service-learning, inclusive education, pedagogical content knowledge, and pedagogical models had the highest citation rates, with "perceptions" and "beliefs" being the most frequently used keywords in the research. The most-cited study, with 123 citations, aimed to develop a teaching model to support the professional preparation of PETE students in inclusive education settings and to empirically validate its effectiveness, achieving the highest citation impact among the 50 articles examined. Furthermore, the Journal of Teaching in Physical Education published the highest number of articles among the studies examined, followed by Physical Education and Sport Pedagogy and European Physical Education Review. Regarding the country distribution by author affiliation, the United States had the highest frequency in the bibliometric dataset, followed by Spain, Australia, and the United Kingdom.

The higher frequency of publications originating from the United States, Spain, Australia, and the United Kingdom may be attributed to the research-oriented teacher education policies and clinical practice models in these countries (Darling-Hammond & Lieberman, 2013; Tatto, 2015). For example, in the United States, many teacher education programs incorporate school-based clinical experiences and performance-based assessments designed to help preservice teachers connect theory with practice (Darling-Hammond, 2017). Similarly, in Australia, national standards developed by the Australian Institute for Teaching and School Leadership (AITSL) focus on strengthening teachers' professional knowledge, skills, and research-based practice competencies (Darling-Hammond & Lieberman, 2013; Dawborn-Gundlach, 2025). Teacher training policies in Türkiye have been shaped from the Republican era to the present by various reform processes aimed at strengthening teacher competencies and enhancing the quality of teacher education (Karakaya & Özcan, 2026). The 2024 Teaching Profession Law, a recent example of such policies, establishes a new legal framework for teacher selection, training, and professional development (Teaching Profession Law, 2024). In conclusion, national policies may have contributed to productivity in this scientific field. Indeed, research findings indicate that countries with specific science policies exhibit higher frequencies.

Thematic map results indicated that the clusters “attitudes, children, disabilities, experiences, behavior, and sport” have high centrality and density values in the PETE student literature. These clusters, therefore, represent the most dominant research topics within the 50 most-cited PETE studies. These results suggest that preservice teachers' attitudes, inclusive education approaches, and classroom experiences are central to the teacher education process. Indeed, inclusive physical education has gained prominence in recent years, particularly in studies that focus on increasing participation among children with disabilities and strengthening teachers' inclusive pedagogical awareness (Hutzler et al., 2019; Liang et al., 2022; Qi & Ha, 2012). Similarly, research aimed at developing preservice teachers' pedagogical competencies has emphasized the importance of affective learning and behavior management skills in teaching competencies (Gerdin et al., 2018; Lavay et al., 2012). Furthermore, the high centrality of the themes "beliefs" and "perceptions" in the middle region is related to the pedagogical belief systems that directly affect preservice teachers' classroom experiences and the identity

formation processes that form the basis of their professional development (Beauchamp & Thomas, 2009; Fives & Buehl, 2012). This may suggest that these themes are considered an important area of research for teacher education processes.

In contrast, the low density of themes related to students, validation, and adolescents, despite their high centrality, suggests that these areas, while important, have not been adequately examined in the literature. Emphasizing these issues in teacher education can enable teachers to understand better the cognitive, affective, and physical characteristics of the age group they will be working with, allowing them to adapt their teaching strategies to be age-appropriate (Bailey, 2006; Christodoulakis et al., 2024). Especially during adolescence, teachers' autonomy-supportive approaches can increase students' motivation and strengthen individuals' active lifestyle habits (Trigueros et al., 2019). Furthermore, the "validation" theme, which focuses on the validity and reliability of measurement and evaluation tools used in physical education teacher research, is methodologically important. Reliable tools can allow for the accurate assessment of preservice teachers' pedagogical competencies, measurement and evaluation skills, and teaching performance (Arslan et al., 2013; Kim & Kwak, 2022). However, despite addressing issues such as diversity, gender, intersectionality, and gender equality, these topics remain under-researched in the literature (Pollock et al., 2021; Rukavina et al., 2019). These issues are critical in physical education teacher preparation because encouraging prospective teachers to value cultural diversity and individual differences enables them to adopt inclusive pedagogies and create equitable learning opportunities for all students (Rukavina et al., 2019). Similarly, gender equality training can empower teachers to challenge the biases they unknowingly transmit, thereby increasing girls' participation in physical activity (Pollock et al., 2021). Integrating issues such as gender equality, inclusivity, instructional technology, and diversity into teacher education curricula and making them a research topic in the literature may be important in terms of improving teacher candidates' pedagogical competencies, professional awareness, and adaptation to the contemporary education approach (Barber, 2018; Batista et al., 2024; Tondeur et al., 2017).

This study has several limitations. First, it only included articles indexed in the WoS database and published in English. Therefore, relevant studies in other languages or in different databases (e.g., Scopus, ERIC, SPORTDiscus) may have been excluded. Second, the use of specific keyword combinations may have led to some relevant articles being overlooked due to limitations inherent in the WoS indexing structure. Additionally, due to the high methodological diversity (qualitative, quantitative, mixed) of the studies included in the systematic review, direct comparison of findings was limited. Finally, selecting studies based on total citation counts may favor older publications, which have had more time to accumulate citations. In contrast, more recent but potentially influential studies may be underrepresented. Citation counts may also change over time; therefore, the present findings reflect the WoS citation data available on the search date.

Consequently, among the 50 most-cited PETE studies examined, publication frequency increased after 2010. Studies have focused on inclusive education, service-learning, pedagogical content knowledge (PCK), and the integration of technology. Research has been published primarily in the Journal of Teaching in Physical Education, Physical Education and

Sport Pedagogy, and European Physical Education Review, with Chiva-Bartoll, Dervent, and Block among the most prolific researchers. Based on the thematic map findings, future research could focus on themes that demonstrate limited development or connectivity within the 50 most-cited PETE studies. Furthermore, experimental designs incorporating service-learning and cultural awareness could prove effective in addressing gaps in the literature regarding PETE students. Conducting research in these areas and developing teacher education programs centered on these themes could enhance pre-service teachers' awareness of equity, inclusion, and cultural sensitivity, as well as their pedagogical understanding. The study's findings offer concrete, practical implications for field experts, researchers, and practitioners aiming to improve teacher education processes.

Abbreviations

PETE – Physical Education Teacher Education

PCK – Pedagogical Content Knowledge

WoS – Web of Science

PRISMA – Preferred Reporting Items for Systematic Reviews and Meta-Analyses

SWiM – Synthesis Without Meta-analysis

BIBLIO – Bibliometric Review Guideline

OSF – Open Science Framework

TPACK – Technological Pedagogical Content Knowledge

AITSL – Australian Institute for Teaching and School Leadership

PICOS – Population, Intervention, Comparator, Outcomes, and Study Design

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All three authors contributed equally to all stages of the research.

Conflict of Interest Statement

The authors declare that there is no conflict of interest related to the research.

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