7

by Anonymous Anonymous

Submission date: 18-Jan-2024 09:13AM (UTC+0700)
Submission ID: 2183304065
File name: 7._Scopus_Q3_dan_WoS_ESCI_Sport_TK.pdf (651.9K)
Word count: 5214
Character count: 30209

SPORT TK-EuroAmerican Journal of Sport Sciences

https://revistas.um.es/sportk Online ISSN: 2340-8812

Received: **25/11/2021.** Accepted: **03/02/2022.** Published: **27-03-2022**

Educational technology in physical education learning: A bibliometric analysis using Scopus database

Feby Elra Perdima[1]*, Suwarni Suwarni[1], Novri Gazali[2]

[1] Universitas Dehasen, Bengkulu, Indonesia.

[2] Universitas Islam Riau, Pekanbaru, Indonesia

* Correspondence: Feby Elra Perdima; feby.elra@unived.ac.id

ABSTRACT

The primary aim of the present study was to conduct a bibliometric analysis of the journal articles published in Scopus database on educational technology in physical education learning. In accordance with the objectives of this study, a systematic search was carried out in the Scopus database, which included high-quality scientific literature in more than 250 disciplines, including social sciences, and humanities. "Technology and Physical Education", followed by "Education" and "School" were the primary search terms used for the identification of studies and several health based databases were searched in English language literature in the Scopus database from 1999-2021. A total of 131 journal articles were published in the Scopus database within the time line of 1999-2021. A very low amount of literature was available relevant to technology and physical education within the timeframe of 1999 to 2009. Based on publications in the Scopus database, the findings revealed that: 1) The number of publications has increased, although there was an up-and-down trend from year to year. 2) Most of the publications were written by researchers located in several countries and universities. 3) "Structure and content of the educational technology of managing students' healthy lifestyle" written by Alexander & Vladislav (2015) was the most cited article with 46 citations. 4) Universidad de La Sabana, Colombia, was found to be the most productive institution with 5 publications. 5) The keyword with the highest number of occurrences (19) in the research sample was "educational technology selection".

KEYWORDS

Technology; Physical Education; School; Bibliometrics; Scopus

1. INTRODUCTION

The learning process is a two-way road between teachers and students in the classroom. It involves various activities which ensure student success to achieve learning objectives (Putria et al., 2020). Among the pool of subjects, one of subjects with key importance is the subjects of physical education and sports which are carried out as part of a regular and continuous educational process to acquire knowledge, personality, skills, health, and physical fitness (Kemenpora, 2005).

Physical education as part of educational curriculum has the aim of increasing the potential of students to have noble character, are healthy, knowledgeable, capable, innovative and independent. To achieve this goal, educators should pay attention to the quality of the learning process. Hence, the implementation of physical education should be done very technically to produce quality output (Juditya & Suwandar, 2016).

The ongoing advancements in the field of utilization of technology in the schools has influenced the thought process of the educators regarding their planning, design instruction, and assessment methods of their students. Innovations in educational technology have changed communication systems, learning resources, and lesson ideas. Innovative technology facilitates creativity and learning productivity.

Technology consist of computer programs, Internet programs, or other assistive devices, digital and communicative equipment. Classroom teachers have integrated this form of technology over the period of time using a variety of methods through different styles and practices (Gibbone et al., 2010). In the current era, the application of learning using technology provides certain challenges for stakeholders, such as teachers, students, institutions and even provides challenges for the wider community such as parents. Simultaneously the students need to adapt to the ongoing technology based learning atmosphere in the form of psychological readiness (Salsabila et al., 2020). There are several views that contribute to the teacher's decision regarding the use of technology. The four major reasons behind the use of technology are, perceptions of the relevance and importance of technology; teaching styles; technological prowess; and teaching context (Albion & Ertmer, 2002).

Many researchers across various countries have studied educational technology in physical education learning, such as Mexico (Phelps et al., 2021), China Country (Liu, 2021; Li & Fan, 2021), Sydney, Australia (Lupton, 2021), Great Britain (Sargent & Casey, 2021), Russia (Egorov, Gluzman, & Antipov, 2020; Kostromin & Zaitsev, 2017; Sosunovsky, & Zagrevskaya, 2020), Greece (Tzeni et al., 2020), Belgium , Spain (González-Campos et al., 2018), South Korea (Lee & Lee, 2021),

Portugal (Jacinto Escola, 2018), China (Zhou, 2014) and Serbia (Mandic, Martinovic, & Dejic, 2011).

There is huge scarcity of evidences regarding the use of educational technology in physical education learning, especially in the Scopus database. Although previous research has discussed this bibliometric study, namely about the trend of publication of technological advantages (Abdullah, 2021), topics of physical education and sports (Gümüş et al., 2020), technology in physical education (Calabuig-Moreno et al., 2020). However, to the best of researcher's knowledge, no literature has been retrieved on the bibliometric analysis of educational technology in physical education learning.

Hence the present study was an attempt of the researcher to fill this gap open perspectives for future research, by providing an objective and up-to-date overview of the literature on educational technology in physical education learning. Based on the bibliometric analysis and visualization, researcher fulfilled the desire of teacher educators, and practitioners to obtain good and documented data to develop ideas for their future research. Hence, the aim of the present study was to examine the development of scientific publications and map educational technology research in physical education learning. The research process is focused on the following study questions: (1) How the productivity of educational technology publications in physical education learning develops using the Scopus database? (2) What are the most influential journals, authors, and articles in the field of educational technology in physical education learning? (3) What are the keywords that often appear in the field of educational technology in physical education learning in the Scopus database?

2. METHODS

In accordance with the objectives of this study, a systematic search was carried out in the Scopus database, which included high-quality scientific literature in more than 250 disciplines, including social sciences, and humanities (Cretu & Morandau, 2020). In order to obtain metadata, researchers conducted a detailed search in the Scopus database in the month of August 2021. Technology and Physical Education", followed by "education" and "school" were the primary search terms used for the identification of studies and several health based databases were searched in English language literature in the Scopus database from 1999-2021.

A total of 161 journal articles were published in the Scopus database within the time line of 1999-2021. The researchers filtered the documents which were only limited to journal articles. Researchers mapped key contributors (author, university, and source name), applied keyword occurrence analysis to find out publication trends, and tracked the articles based on the main themes

or topics that emerged in the publication. Data visualization was done with the help of the VOSViewer application (Van Eck & Waltman, 2010). Researchers used several measures in VOSViewer to obtain article metadata, including: 1) Co-occurrence analysis, 2) All keywords, 3) Full counting 4) Minimum number of author documents (Hanief et al., 2021; Jeong & Koo, 2016).

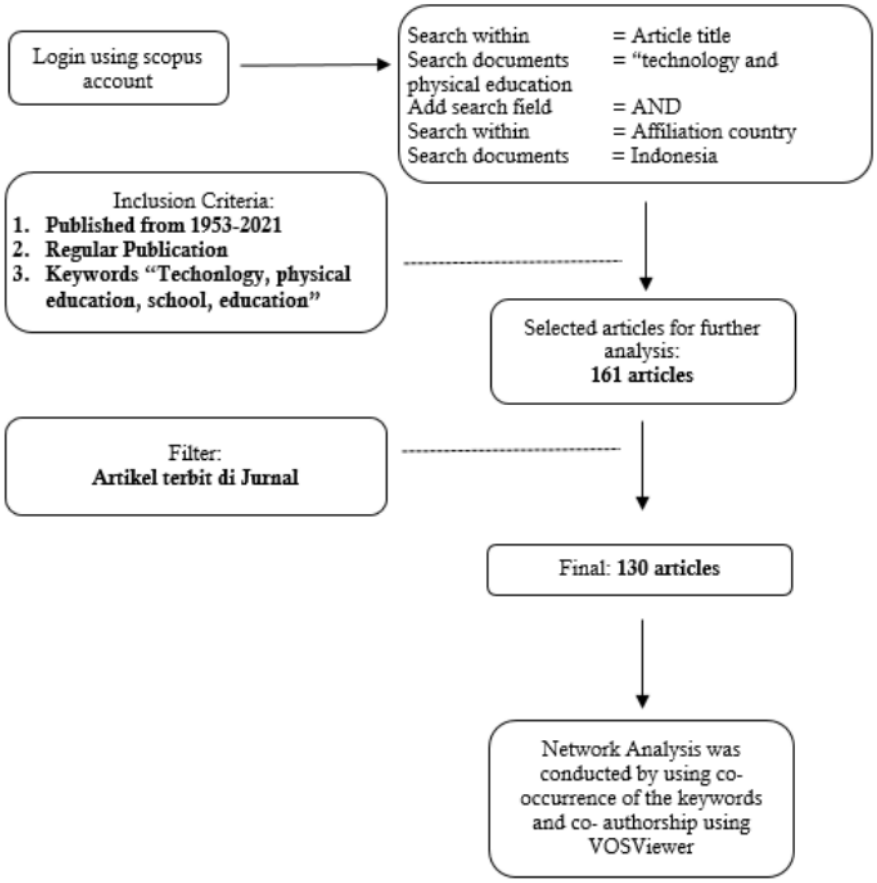

Figure 1. Article Metadata Search Design from Scopus.

3. RESULTS AND DISCUSSION

This section describes the findings of the bibliometric analysis based on the research question. Initially a survey was conducted on literature focusing on its evolution over time, and contributions in the field by country, organization, document type. Secondly, authors examined the most influential journals, leading authors, and cited papers on scholarly works. Lastly, authors studied the analysis of collaboration patterns between authors and countries using co-authorship analysis, on the existing

connections/relationships between authors or journals using co-citation analysis, and between terms or keywords using co-word analysis.

1. *How the productivity of educational technology publications in physical education learning develops using the Scopus database*?

   Very lower amount of literature was available relevant to technology and physical education within the timeframe of 1999 to 2009. Only 13 articles were published until the year 2009. However, the number of publications increased to 56 in the years 2010-2015. A significant drop was found to 35 within the timeline of 2016-2019, reaching to 12 journal articles published in the year 2020 and 10 in the year 2021. The reason behind this drop in the publications could be the lockdown during the Covid-19 pandemic in which schools or colleges were closed for quite a long period of time. Researchers encountered lot of difficulties in conducting the research in schools or universities. The dynamics of changes in publication productivity can be seen in Figure 2.

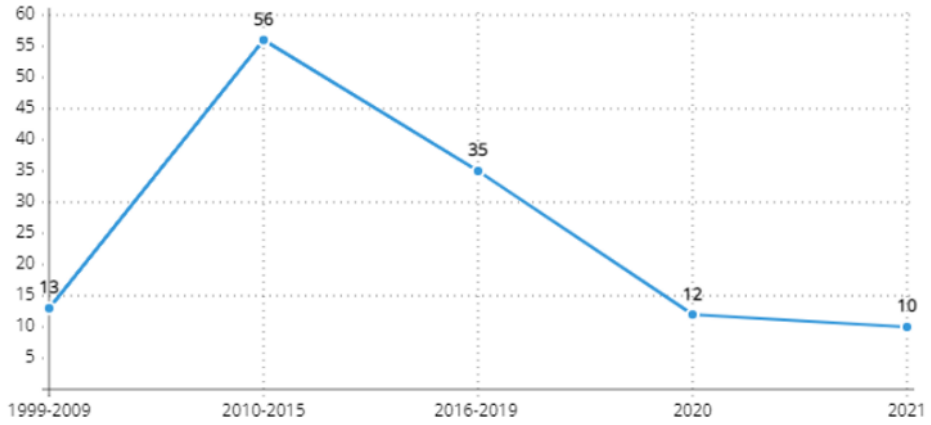

Figure 2. Scientific Publication Productivity Entitled "Technology" and "Physical Education" from Year to Year. Source: Research Data Taken from Scopus Database

From the published information obtained, the problems studied in the aspects of Technology and Physical Education depend on several aspects determined by the Scopus database. The focus area of the journal Theory i Practica Fizicheskoy Kultury is the most dominant with 35 publications. Universidad de La Sabana, Colombia is the most productive institution with 5 publications, while the author mostly published in this field is Mandic D, with 3 publications. The ten main subject areas, affiliations, sources of titles, and authors can be seen in Table 1.

Table 1. Publication Profile for Technology and Physical Education Fields

Category	Ten Leading Publications
Source Title	Teoriya I Praktika Fizicheskoy Kultury (31), Journal of Physical Education and Sport (5), Journal of Physical Education and Sport (4), International Conference on Engineering Education and International Conference on Education and Educational Technologies – Proceedings (4), International Journal of Smart Home (4), Proceedings – 2010 International Conference on Artificial Intelligence and Education, ICAIE 2010 (4), ACM International Conference Proceeding Series (3), European Journal of Social Sciences (2), Energy Education Science and Technology Part B: Social and Educational Studies (2), Teaching and Teacher Education (2)
Affiliation	Universidad de La Sabana, Colombia (5), Department of Physical Education, Shanghai College of Health Sciences, Shanghai, China (4), Gazi University, School of Physical Education and Sports, Ankara, Turkey (4), Russian State Social University, Moscow, Russian Federation (4), Sakarya University Education Faculty, Physical Education and Sports Teaching Department, Sakarya, Turkey (4), St. Petersburg Mining University, St. Petersburg, Russian Federation (3), Teacher Training Faculty, University of Belgrade, Serbia; University of East Sarajevo, Bosnia and Herzegovina (3), Perm State Humanitarian and Pedagogical University, Perm, Russian Federation (3), National Research Tomsk State University, Tomsk, Russian Federation (3), Lviv Polytechnic National University, Str. Bandera, 12, Lviv, 79013, Ukraine; National University «Lviv Polytechnic», Str. Bandera, 12, Lviv, 79013, Ukraine (3)
Author	*Mandic D.* (3), Bolotin A.E. (3), Bolotin A (3), Yaman M.(2), Zhang F (2), Mikhaylova I (2), Kretschmann R. (2), Krause J.M (2), Hergüner G (2), Gallego-Lema V (2).

2. *What are the most influential journals, authors, and articles in the field of educational technology in physical education learning*?

A total of 131 articles were published in the journals. The impact or influence of these articles is based on the number of citations each article. The undermentioned table describes the influence of each journal, author and article title in the field of technology and physical education.

Table 2. Top 10 journals including "Technology" and "Physical Education". Documents Indexed in Scopus

Journal	Papers	%
Teoriya I Praktika Fizicheskoy Kultury	31	23.66
Journal of Physical Education and Sport	5	3.81
Journal of Physical Education and Sportys	4	3.05
International Conference on Engineering Education and International Conference on Education and Educational Technologies – Proceedings	4	3.05
International Journal of Smart Home Proceedings – 2010 International Conference on Artificial Intelligence and Education, ICAIE 2010	4	3.05
Home Proceedings – 2010 International Conference on Artificial Intelligence and Education, ICAIE 2010	4	3.05
ACM International Conference Proceeding Series	3	2.29
European Journal of Social Sciences	2	1.52

Energy Education Science and Technology Part B: Social and Educational Studies	2	1.52
Teaching and Teacher Education	2	1.52

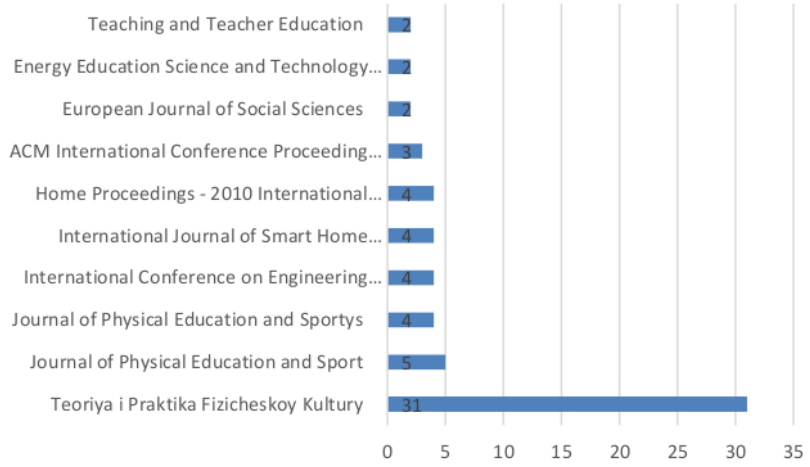

Figure 3. Top 10 journals including "Technology" and "Physical Education". Documents Indexed in Scopus

Table 2 and Figure 3 present the top 10 journals in terms of number of articles published in the fields of technology and physical education. Theory i Practical Fizicheskoy Kultury published maximum number of articles (31) (23.66%), followed by Journal of Physical Education and Sport with 5 articles (3.81%), and Journal of Physical Education and Sportys was ranked third with 4 articles (3.05%).

Figure 4 presents the top 10 journals in terms of the number of sources cited in the fields of technology and physical education. Of the 10 identified, the Journal of Physical Education and Sport had the maximum influence with 46 citations and interestingly. In this circulation, the journal had one article entitled "Structure and content of the educational technology of managing students' healthy lifestyle", written by Alexander & Vladislav (2015).

Next, we use the number of publications and the number of citations by authors as a way to identify the most active and influential authors in the fields of technology and physical education. More clearly can be seen in Table 3 and Figure 5.

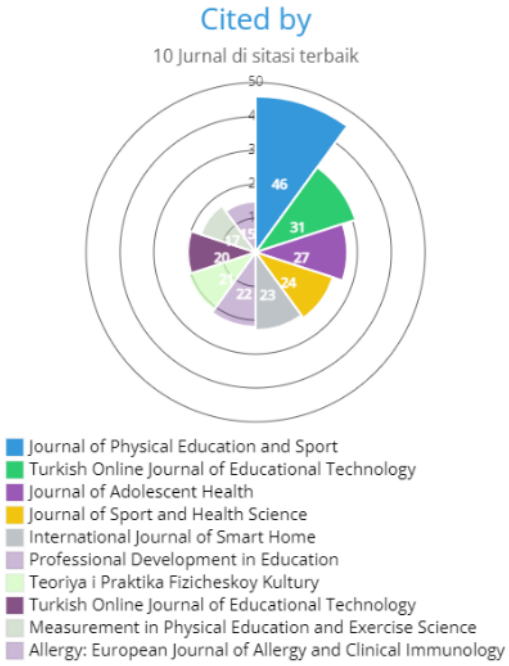

Figure 4. Top 10 journals Cited in Technology and Physical Education Field

Table 3. Most Cited Authors in the Field of Educational Technology and Physical Education in the Scopus Database

Authors	Country	Documents	Citations
Alexander B., Vladislav B.	Russian	1	46
Kretschmann R.	Turkish	2	40
Dwyer J.J.M	Canada	1	27
Castelli D.M.,	United States	1	24
Zhou B.	China	1	23
Fletcher T., Bullock S.M.	Canada	1	22
Mikhaylova I.V.	Russian	1	21
Bebetsos E., Antoniou P.	Greece	1	20
Juniu S.	United States	1	17
Borres M.P.,	Sweden	1	15

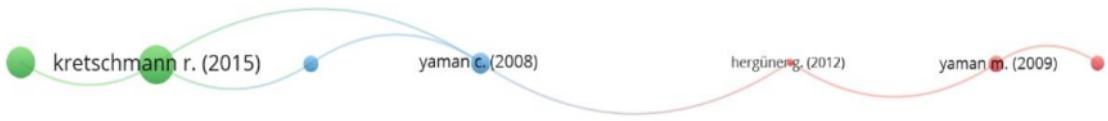

Figure 5. Most Cited Authors in the Field of Technology and Physical Education in the Scopus Database.

Based on the number of journal articles published in the Scopus and the numbers of citations, authors were keen to know the most influential articles in the fields of technology and physical education. Out of 131 articles published in the Scopus database, the journal article entitled "Structure and content of the educational technology of managing students' healthy lifestyle" was found to be the most cited journal article with 46 citations. The study was authored by Alexander & Vladislav, (2015).

Table 4. Most Cited Articles in the Scopus Database on Educational Technology and Physical Education

Title	Authors	Journal	Citations	Years
Structure and content of the educational technology of managing students' healthy lifestyle	(Alexander & Vladislav, 2015)	Turkish Online Journal of Educational Technology	46	2015
Physical education teachers' subjective theories about integrating information and communication technology (ICT) into physical education	(Kretschmann R., 2015)	Department of Kinesiology, College of Health Sciences, University of Texas at El Paso, United States	31	2015
A Provincial Study of Opportunities for School-based Physical Activity in Secondary Schools	(Dwyer et al., 2006)	Journal of Adolescent Health	27	2006
Contextualizing physical literacy in the school environment: The challenges	(Castelli et al., 2015)	Journal of Sport and Health Science	24	2015
Smart classroom and multimedia network teaching platform application in college physical education teaching	(B. Zhou, 2016)	International Journal of Smart Home	23	2016
Reframing pedagogy while teaching about teaching online: a collaborative self-study	(Fletcher & Bullock, 2015)	Professional Development in Education	22	2015
Adaptive chess educational technology for disabled children	(Mikhaylova et al., 2015)	Teoriya i Praktika Fizicheskoy Kultury	21	2015
Gender differences on attitudes, computer use and physical activity among Greek University students	(Bebetsos, 2009)	Turkish Online Journal of Educational Technology	20	2009
Use of technology for constructivist learning in a performance assessment class	(Juniu, 2006)	Measurement in Physical Education and Exercise Science	17	2006
Asthma and allergies at school - A Swedish national position paper	(Borres et al., 2002)	Allergy: European Journal of Allergy and Clinical Immunology	15	2002

3. *What are the keywords that often appear in the field of technology and physical education in the Scopus Database?*

The analysis of the journal studies helped in building a conceptual map based on the areas of key interest of the researchers. In addition to this, it also highlighted the key trends of the research in the field of technology and physical education. This analysis revealed the relationship between keywords

and terms as co-occurrence of keywords and terms in the same journal article kin the network map (Van Eck & Waltman, 2010; Zupic & Cater, 2015). The analysis was started with the key focus on the "Mesh" Terms and "the primary search terms" using the VOSviewer software. The results of data visualization analysis using VOSViewer revealed that the keywords with the highest number of occurrences in the research sample are educational technology selection (19), computers; education (6), artificial intelligence; physical teaching and technology (4). The ten leading high-frequency keywords and their number of occurrences are provided in the Table 5. A visualization of the item density of high-frequency keywords is presented in Figure 6. Also, Figure 7 presents a network visualization map of authors' keywords.

Table 5. High-frequency keywords for Educational Technology and Physical Education

Keywords	Occurrences
Educational technology selection	19
Computers; Education	6
Physical teaching; Technology	4
Artificial intelligence; Education technology; Modern education; Physical education; Virtualization technology	4
Distance education	3
Anthropic educational technologies	3
Eduacation; Informaiional technology; Internet; Management; Physical education; Research	3
Information technology; Physical education; Physical training	2
Internet; Online instruction; Online research; Physical education; Subject database	2
Modern Educational Technology; Physical Education Students; Public Course	2

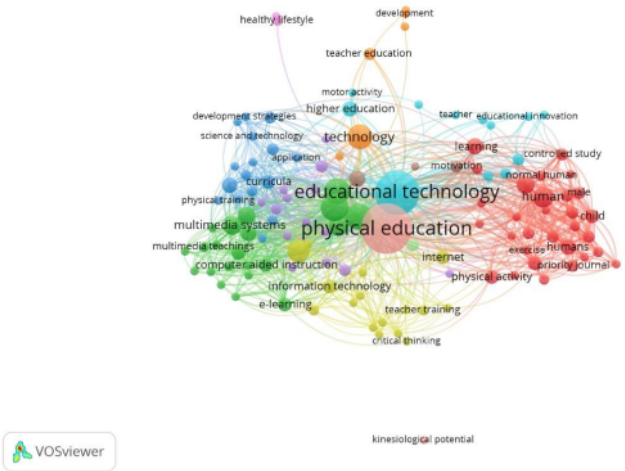

Figure 6. Item density of high-frequency keywords

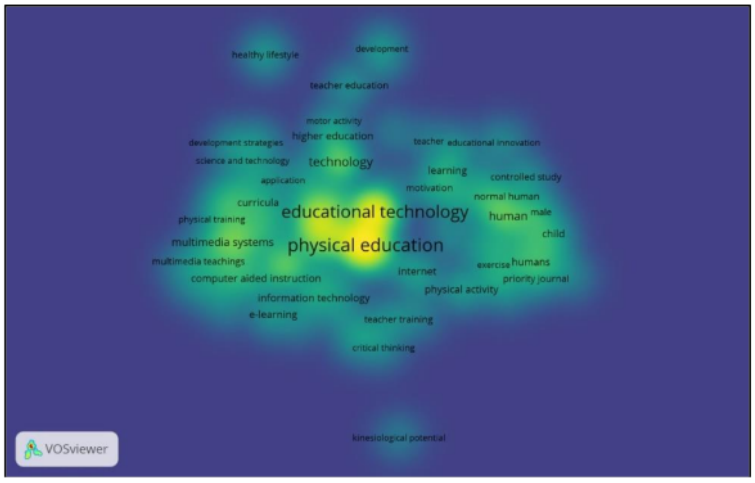

Figure 7. Network Visualization Map of Authors' Keywords

Analysis was also done with respect to the number of articles published per journal. Theory i Practical Fizicheskoy Kultury published the maximum number of articles (31 paper; 23.66%), followed by Journal of Physical Education and Sport with 5 articles (3.81%), and Journal of Physical Education and Sports was ranked third with 4 articles (3.05%). In the list of most influential publications in the field of technology and physical education, 5 articles were found to have more than 20 citations.

Among the list of most influential journal articles, the most cited journal article was authored by Alexander & Vladislav (2015). In this study, authors attempted to validate the educational technology in managing a student's fit lifestyle. Throughout the pedagogical experiment, an increase in indicators were reported. It signifies the level of progress in the ability to monitor a person's health, to organize self-training and recreational sessions, and to design leisure activities on their own. Hence, the authors successfully validated the high efficiency of educational technology to manage students' fit lifestyles.

The second most influential journal article was written by Kretschmann (2015). Among the other important school subjects, physical education (PE) arose in terms of incorporating information and communication technology (ICT) into a regular category. Innovative teaching applications that practice ICT in PE link many stakeholders together directly or indirectly involved in the process of teaching. Which include; students, principals, districts, parents, administrators, policy creators, and last but not least the sports teachers themselves. Each participating stakeholder hold their own personal opinion and action on ICT and PE. The researchers in this study examined the individual philosophy of PE teachers regarding the integration of ICT into PE. Individual philosophies of PE

teachers which indicate the following areas include: students, teachers, equipment, computer literacy, management and category bodies, social interaction, and innovative and modern teaching.

The third most influential journal article was written by Hills et al. (2015). In this study, the authors discussed regarding the opportunities for school-based physical activity for teenagers spending a lot of time in school. This study surveyed Ontario high schools to identify various structured opportunities and their involvement by students. Questionnaires were sent to key informants in 600 randomly selected secondary schools in Ontario.

The fourth most influential journal article was written Zhou (2016). In this study, the authors discussed regarding multimedia teaching, which became an important trend of teaching in universities with the advancement of information technology. At the same time, cloud computing has energetically distributed computing resources according to the number of consumers, and the complexity of the application. The authors analyzed the application of multimedia network teaching programs in teaching physical education at large academies on a cloud computing platform.

The main limitation of the present study was that the authors reviewed and conducted the bibliographic analysis only in journal articles of Scopus. Regarding the strengths of this paper, the present study may help in expanding the horizons of research development in the aspects of educational technology and physical education and can be a source of data for teachers, lecturers, schools, universities and the world of education. Further studies may be conducted on other databases, such as Web of Science.

4. CONCLUSIONS

This study aimed to conduct a bibliometric analysis of articles published in the Scopus database on technology and physical education. A small amount of literature was available relevant to technology and physical education within the timeframe of 1999 to 2009, with only 13 articles published until the year 2009. However, the number of publications increased to 56 in the period 2010-2015. A significant drop was found in 2016-2019 (35 papers), while 12 journal articles were published in the year 2020 and 10 papers in the year 2021.

5. REFERENCES

1. Abdullah, K. H. (2021). Publication Trends of Leadership Excellence: A Bibliometric Review Using VOSviewer. *Advances in Business Research International Journal*, *7*(1), 170-180. https://doi.org/10.24191/abrij.v7i1.12860
2. Albion, P. R., & Ertmer, P. A. (2002). Beyond the foundations: The role of vision and belief in teachers' preparation for integration of technology. *TechTrends*, *46*(5), 34–38.

3. Alexander, B., & Vladislav, B. (2015). Structure and content of the educational technology of managing students' healthy lifestyle. *Journal of Physical Education and Sport*, *15*(3), 362–364. https://doi.org/10.7752/JPES.2015.03054
4. Baymurzin, A. R., Chepik, V. D., & Alifirov, A. I. (2019). Physical education and sport university service: practical basics. *Teoriya i Praktika Fizicheskoy Kultury, 5,* 14-16.
5. Bebetsos, E., & Antoniou, P. (2009). Gender differences on attitudes, computer use and physical activity among Greek University students. *Turkish Online Journal of Educational Technology, 8*(2), 6.
6. Borres, M. P., Abrahamsson, G., Andersson, B., Andersson, B., Bråkenhielm, G., Fabricius, T., Hååg, C., Rinné-Ljungkvist, L., & Foucard, T. (2002). Asthma and allergies at school - A Swedish national position paper. *Allergy: European Journal of Allergy and Clinical Immunology*, *57*(5), 454–457. https://doi.org/10.1034/J.1398-9995.2002.13650.X
7. Calabuig-Moreno, F., González-Serrano, M. H., Fombona, J., & García-Tascón, M. (2020). The emergence of technology in physical education: A general bibliometric analysis with a focus on virtual and augmented reality. *Sustainability*, *12*(7), 1–23. https://doi.org/10.3390/su12072728
8. Castelli, D. M., Barcelona, J. M., & Bryant, L. (2015). Contextualizing physical literacy in the school environment: The challenges. *Journal of Sport and Health Science*, *4*(2), 156–163. https://doi.org/10.1016/J.JSHS.2015.04.003
9. Cretu, D. M., & Morandau, F. (2020). Initial Teacher Education for Inclusive Education: A Bibliometric Analysis of Educational Research. *Sustainability*, *12*, 1–27. https://doi.org/10.3390/su12124923
10. Dwyer, J. J. M., Allison, K. R., LeMoine, K. N., Adlaf, E. M., Goodman, J., Faulkner, G. E. J., & Lysy, D. C. (2006). A Provincial Study of Opportunities for School-based Physical Activity in Secondary Schools. *Journal of Adolescent Health*, *39*(1), 80–86. https://doi.org/10.1016/J.JADOHEALTH.2005.10.004
11. Egorov, V. N., Gluzman, N. A., & Antipov, A. V. (2020). Physical education in context of current problems in higher education. *Theory and Practice of Physical Culture, 10,* 35-37.
12. Fletcher, T., & Bullock, S. M. (2015). Reframing pedagogy while teaching about teaching online: a collaborative self-study. *Professional Development in Education*, *41*(4), 690–706. https://doi.org/10.1080/19415257.2014.938357
13. Gibbone, A., Rukavina, P., & Silverman, S. (2010). Technology Integration in Secondary Physical Education: Teachers' Attitudes and Practice. *Journal of Educational Technology Development and Exchange*, *3*(1), 27-42. https://doi.org/10.18785/jetde.0301.03
14. González-Campos, G., Castañeda-Vázquez, C., & Campos-Mesa, M. D. C. (2018). Continuous assessment and interactive response systems in higher education. *Journal of Human Sport and Exercise*, *13*(3), 667–681. https://doi.org/10.14198/JHSE.2018.133.17
15. Gümüş, H., Gençoğlu, C., & Şahin, T. (2020). Physical Education and Sports: Bibliometric Analysis of the Eric Database. *International Online Journal of Education and Teaching (IOJET)*, *7*(4), 1823–1837.
16. Hanief, Y. N., Kardiyanto, D. W., Winarno, M. E., & Haqiyah, A. (2021). Development of Indonesia Scientific Publications on Physical Education in Reputable International

Journals: A Bibliometric Analysis. *Jurnal Pendidikan Jasmani Dan Olahraga*, *6*(1), 59–67. https://doi.org/10.17509/jpjo.v6i1.32335

17. Hernández-Torrano, D., Somerton, M., & Helmer, J. (2020). Mapping research on inclusive education since Salamanca Statement: a bibliometric review of the literature over 25 years. *International Journal of Inclusive Education, 26*(9), 893-912. https://doi.org/10.1080/13603116.2020.1747555
18. Hills, A. P., Dengel, D. R., & Lubans, D. R. (2015). Supporting Public Health Priorities: Recommendations for Physical Education and Physical Activity Promotion in Schools. *Progress in Cardiovascular Diseases*, *57*(4), 368–374. https://doi.org/10.1016/j.pcad.2014.09.010
19. Jacinto Escola, J. J. (2018). Applications ICT in Teaching Physical Education. *Retos-nuevas tendencias en educacion fisica deporte y recreacion, 3,* 371-376.
20. Jeong, D., & Koo, Y. (2016). Analysis of Trend and Convergence for Science and Technology using the VOSviewer. *International Journal of Contents*, *12*(3), 54–58. https://doi.org/10.5392/IJoC.2016.12.3.054
21. Juditya, S., & Suwandar, E. (2016). Peregangan dinamis dan PNF (proprioceptive neuromuscular facilitation) terhadap fleksibilitas pada cabang olahraga senam lantai. Seminar Nasional Olahraga Tahun 2016, 216-227.
22. Juniu, S. (2006). Use of technology for constructivist learning in a performance assessment class. *Measurement in Physical Education and Exercise Science*, *10*(1), 67–79. https://doi.org/10.1207/S15327841MPEE1001_5
23. Kemenpora. (2005). Undang-undang sistem keolahragaan nasional.
24. Kostromin, & Zaitsev. (2017). Applied competitive boxing practices in academic physical education system. *Theory and Practice of Physical Culture, 5,* 6.
25. Kretschmann R. (2015). Physical education teachers' subjective theories about integrating information and communication technology (ICT) into physical education. *Turkish Online Journal of Educational Technology-TOJET, 14*(1), 68-96.
26. Lee, H. S., & Lee, J. (2021). Applying artificial intelligence in physical education and future perspectives. *Sustainability*, *13*(1), 1–16. https://doi.org/10.3390/SU13010351
27. Li, W., & Fan, X. (2021). Construction of Network Multimedia Teaching Platform System of College Sports. *Mathematical Problems in Engineering*, *2021*, 1-11. https://doi.org/10.1155/2021/6304703
28. Liu, Y. (2021). Research on diversified model of pe teaching evaluation in universities based on modern information technology. *ACM International Conference Proceeding Series*, 1481–1484. https://doi.org/10.1145/3456887.3459704
29. Lupton, D. (2021). 'Honestly no, I've never looked at it': teachers' understandings and practices related to students' personal data in digitised health and physical education. *Learning, Media and Technology*, *46*(3), 281–293. https://doi.org/10.1080/17439884.2021.1896541
30. Mandic, D., Martinovic, D., & Dejic, M. (2011). *Computers in Modern Educational Technology*. In Proceeding of the 2nd International Conference on Educational & Educational Technologies (pp. 14-16).

31. Mikhaylova, I. V., Shmeleva, S. V., & Makhov, A. S. (2015). Adaptive chess educational technology for disabled children. *Theory and practice of physical culture, 7,* 12.
32. Phelps, A., Colburn, J., Hodges, M., Knipe, R., Doherty, B., & Keating, X. D. (2021). A qualitative exploration of technology use among preservice physical education teachers in a secondary methods course. *Teaching and Teacher Education*, *105,* 103400. https://doi.org/10.1016/J.TATE.2021.103400
33. Putria, H., Maula, L. H., & Uswatun, D. A. (2020). Analisis Proses Pembelajaran dalam Jaringan (DARING) Masa Pandemi Covid- 19 Pada Guru Sekolah Dasar. *Jurnal Basicedu*, *4*(4), 861–870. https://doi.org/10.31004/BASICEDU.V4I4.460
34. Salsabila, U. H., Sari, L. I., Lathif, K. H., Lestari, A. P., & Ayuning, A. (2020). Peran Teknologi Dalam Pembelajaran Di Masa Pandemi Covid-19. *Urnal Penelitian Dan Kajian Sosial Keagamaan*, *17*(2), 188-198.
35. Sargent, J., & Casey, A. (2021). Appreciative inquiry for physical education and sport pedagogy research: a methodological illustration through teachers' uses of digital technology. *Sport, Education and Society*, *26*(1), 45–57. https://doi.org/10.1080/13573322.2019.1689942
36. Sosunovsky, V. S., & Zagrevskaya, A. I. (2020). Kinesiological educational technology in physical education of preschoolers. *Theory and Practice of Physical Culture, 11,* 30-32.
37. Tzeni, D., Ioannis, A., Athanasios, L., & Amalia, S. (2020). Determining effective leadership qualities of a school principal from the perception of PE teachers in Greece. *Journal of Physical Education and Sport*, *20*(3), 2126–2135. https://doi.org/10.7752/jpes.2020.s3286
38. Van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, *84*(2), 523–538. https://doi.org/10.1007/s11192-009-0146-3
39. Van Eck, N. J., & Waltman, L. (2019). *Manual for VOSviwer version 1.6.10*. CWTS Meaningful metrics. Univeristeit Leiden.
40. Zhou, B. (2016). Smart classroom and multimedia network teaching platform application in college physical education teaching. *International Journal of Smart Home*, *10*(10), 145–156. https://doi.org/10.14257/IJSH.2016.10.10.14
41. Zhou, Y. J. (2014). Application of information technology in physical education and training. *Advanced Materials Research*, *926–930*, 4465–4468. https://doi.org/10.4028/www.scientific.net/AMR.926-930.4465
42. Zupic, I., & Cater, T. (2015). Bibliometric Methods in Management and Organization. *Organizational Research Methods*, *18*(3), 1–44. https://doi.org/10.1177/1094428114562629

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

FUNDING

This research received no external funding.

7

ORIGINALITY REPORT

20%	17%	13%	12%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

MATCH ALL SOURCES (ONLY SELECTED SOURCE PRINTED)

2%

★ Maryna Diachenko-Bohun, Nataliia Hrytsai, Maryna Grynova, Igor Grygus, Walery Zukow. "The readiness formation of future biology teachers for healthcare-safety technologies realization in professional activity", Education and Information Technologies, 2018

Publication

Exclude quotes	Off	Exclude matches	< 1%
Exclude bibliography	On		