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<https://ejournal.upi.edu/index.php/penjas/article/view/6-1-08>DOI: <https://doi.org/10.17509/jpjo.v6i1.32335>**Development of Indonesia Scientific Publications on Physical Education in Reputable International Journals: A Bibliometric Analysis****Yulingga Nanda Hanief<sup>1\*</sup>, Deddy Whinata Kardiyanto<sup>2</sup>, Mashuri Eko Winarno<sup>3</sup>, Aridhotul Haqiyah<sup>4</sup>**<sup>1</sup>Department of Sports Coaching, Faculty of Sports Science, Universitas Negeri Malang, Indonesia<sup>2</sup>Department of Physical Education Health and Recreation, Faculty of Sports, Universitas Sebelas Maret Surakarta, Indonesia<sup>3</sup>Department of Sports Education, Faculty of Sports Science, Universitas Negeri Malang, Indonesia<sup>4</sup>Department of Physical Education Health and Recreation, Faculty of Teacher Training and Education, Universitas Islam 45 Bekasi, Indonesia**Article Info***Article History :**Received February 2021**Revised February 2021**Accepted March 2021**Available online April 2021**Keywords :**Bibliometric, co-occurrence keyword analysis, physical education, publication trends, research mapping***Abstract**

This study was aimed at determining trends in scientific publications and map the scope of thematic research in the field of Physical Education, especially for articles published in reputable international journals (Scopus) written by Indonesian authors. The research process was focused on the following questions: (1) how is the productivity of Physical Education publications developing in Indonesia?; (2) who are the main contributors (author, University, and name of publication) for the published publications?; (3) what are the thematic areas that attract the most attention of academics?; and (4) what topics are emerging in the field of publication?. The study used the Scopus database as the source of bibliometric analysis data for the research sampling process. The research samples were 55 articles found through keyword "physical education" in the "article title" published in international journals indexed by Scopus. This research applied keyword co-occurrence analysis to identify and explore the main thematic areas and topics that appeared in publications. The VOSviewer software was used to support the analysis process and visualize findings. The results of the study show that Physical Education is a research area that still needs to be developed, referring to the productivity of publications from 2013 to 2020, which the range of publication was still below 15 per year. The collected research results were scattered in the fields of engineering studies (21), social sciences (18), and materials science (14). The main contributor of the publication was Indonesia University of Education (24). The most prolific author was Tedi Supriyadi from the Indonesia University of Education. In the Physical Education publications, six major thematic groups were identified, namely: (1) physical activity of school pupils; (2) sports; (3) Physical Education; (4) health; (5) education; and (6) creativity. This study conveyed to public that the mapping using bibliometric analysis contributes to a better understanding of the development patterns of publications in the field of Physical Education. By finding thematic areas and topics appearing in publications, this study conveys information of important issues for further research and theory development as well as for educational practice or application.

## INTRODUCTION

Physical Education is considered as a part of education that promotes learning through movement, but Physical Education is not limited to doing sports, performing physical activity, and preventing obesity without education (Quennerstedt, 2019). In the last few years, research on Physical Education in different countries has experienced a rapid development. Physical Education has the potential to have long-term health impacts on society (Pate et al., 2011). Physical activity during Physical Education process provides an important opportunity for children to be physically active (Meyer et al., 2012) and becomes a medium for learning movements (Quennerstedt & Larsson, 2015) as well as the art in teaching (Quennerstedt, 2019).

In Indonesia, the development of research on Physical Education has a good trend. It is due to the curiosity of academics to further investigate the application of Physical Education in Indonesia. Moreover, achieving learning objectives requires a curriculum compiled by an educational unit (Mustafa & Dwiyo, 2020). The curriculum has changed according to the current needs and challenges (Mulyasa, 2017). As we know that, in Indonesia, the curriculum has changed several times. The curriculum change is one of the triggers of problems in schools, especially in Physical Education subjects, so that students, teachers, and lecturers are actively involved in conducting research to solve the occurring problems. However, the increase of the research productivity in the field of Physical Education in Indonesia has never been thoroughly mapped and profiled using the bibliometric method.

Study of Fan & Gan (2010) analyzed Physical Education articles published in 2005-2009, but due to their limited scope, the study had not yet provided a factual, comprehensive, and up-to-date bibliometric profile. Hinojo-Lucena et al. (2019) analyzed scientific publications published before 2017 on the Web of Science (WOS) database. However, the results of the study were limited to the chronological distribution of the number of publications from year to year and the preparation of publication profiles focusing on the analysis of impact of scientific journals. Therefore, it became one of the gaps to be developed as well as the reason why this study was conducted.

Therefore, this study aimed to examine the development of scientific publications and map the thematic

coverage of Physical Education research. The research process was focused on the following study questions: (1) how is the productivity of Physical Education publications developing in Indonesia? (2) who are the main contributors (author, University, and publication name) of the published publications? (3) what are the thematic areas that attract the most attention of academics? (4) what topics are emerging in the field of publication?

## METHODS

### Sources

Researchers used the Scopus database as the data source for the sampling process. Data were collected on 18 January 2021 using "physical education" word in the article title. Fifty-six publications, consisting of 29 articles from journals and 26 articles from proceedings, were obtained. The range of publication year used was before 2021.

### Research Design

To obtain the article metadata, researchers searched phrases in Scopus database on 18 January 2021, covering Title Search "physical education" AND Affiliation Country "Indonesia". There were 56 publications indexed by Scopus. The researchers excluded articles that are still in press (1 article), so that there were 55 publications that were ready for analysis. The tracing procedure is presented in Figure 1.

This study used bibliometric analysis using publication mapping (Porter et al., 2002) and keyword co-occurrence analysis, which is a type of co-word analysis (He, 1999). The researchers mapped the main contributors (author, university, and source name), applied a keyword co-occurrence analysis to find out publication trends, and traced the main thematic or topics that appeared in the publication. To present the data, researchers used data visualization with the help of the VOSViewer application developed by researchers at Laiden University (van Eck & Waltman, 2010). Researchers used some parameters in VOSViewer in obtaining article metadata including: 1) Type of analysis (Co-occurrence analysis), 2) Unit of analysis (All keywords), 3) Counting method (Full counting), and 4) Minimum number of documents of author (2 documents).

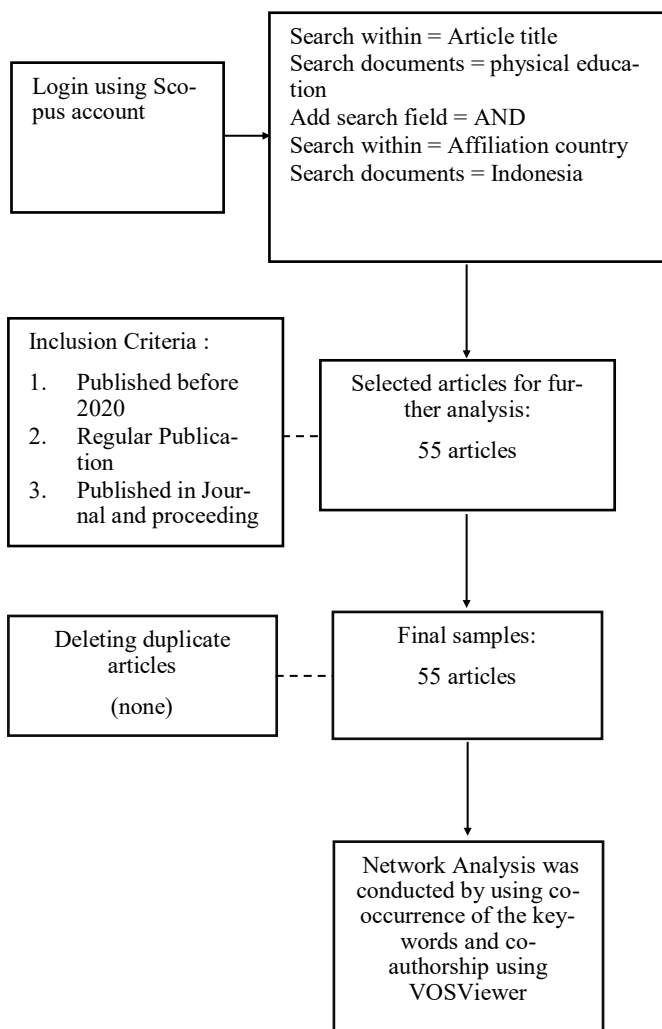


Figure 1. Article Metadata Search Design from Scopus

**RESULT**

**Publication Map and Productivity in Physical Education**

The first article with title and keyword "physical education" was published in 2013. Since then, the development of publications in the Physical Education area had started to increase. In 2017, there was a significant increase where the number of publications recorded in the Scopus database was 14 articles. However, there was also a drastic decline in 2018. In 2019, there was a similar increase as in 2017 (14 articles), while in 2020, it decreased into 13 articles. The dynamics changes of the productivity of these publications can be seen in Figure 2.

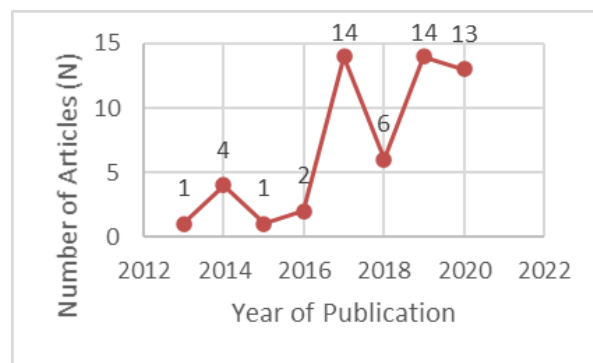


Figure 2. Scientific Publication Productivity Entitled "Physical Education" from Year to Year. Source: Research Data Taken from Scopus Database

From the recorded publications, the problems studied in the field of Physical Education were focused on several subject areas defined by the Scopus database. The subject areas included Engineering, Social Sciences, and Materials Science which were the most dominant subject areas of the 55 publications. The Universitas Pendidikan Indonesia (Indonesia University of Education) was the most productive institution, as well as the institution with the most contributors (Tedi Supriyadi, Tatang Muhtar, Adang Suherman, and Ayi Suherman). IOP Conference Series Materials Science and Engineering became the first choice among other publication media to publish the research results (14 articles). It was followed by the Journal of Physics Conference Series (10 articles). The 10 leading subject areas, affiliations, source titles, and authors can be seen in Table 1.

Table 1 presents that the first rank on the subject area is Engineering with 21 documents. This is closely related to the publication media of the articles. Related to the Source Title (Table 1), there were 14 documents published at the IOP Conference Series Materials Science and Engineering, where the proceedings only contained articles with materials science and engineering themes.

**Physical Education as A Thematic Cluster**

The results of data visualization analysis using VOSViewer show that the keywords with the highest number of occurrences in the sample of the study were 'physical education', 'students', 'sports', 'education', 'physical activity', 'teaching', 'education computing',

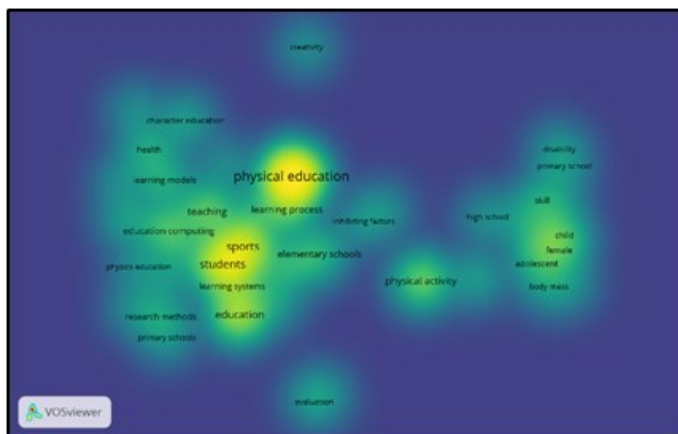
**Table 1.** Publication Profile in Physical Education Field of Study

Category	Ten Leading Publications
Subject Area	Engineering (21); Social Sciences (18); Materials Science (14); Physics and Astronomy (10); Biochemistry, Genetics and Molecular Biology (8); Medicine ((7); Arts and Humanities (6); Health Professions (6); Computer Science (5); dan Economics, Econometrics, and Finance (5)
Affiliation	Universitas Pendidikan Indonesia (Indonesia University of Education) (24); Universitas Negeri Yogyakarta (Yogyakarta State University) (7); Universitas Negeri Surabaya (Surabaya State University) (4); Universitas Negeri Jakarta (Jakarta State University) (4); Universitas Negeri Padang (Padang State University) (4); Universitas Musamus Merauke (Musamus Merauke University) (2); Fatmawati General Hospital (1); Dr. Kariadi Hospital (1); Eijkman Institute of Molecular Biology (1); and Universitas Siliwangi (Siliwangi University) (1)
Source Title	IOP Conference Series Materials Science and Engineering (14); Journal of Physics Conference Series (10); Asian Social Science (5); International Journal of Human Movement And Sports Sciences (4); Cakrawala Pendidikan (3); International Journal of Engineering and Technology UAE (2); International Journal of Learning Teaching And Educational Research (2); International Journal of Advanced Research in Engineering and Technology (1); International Journal of Advanced Science and Technology (1); dan International Journal of Evaluation and Research in Education
Author	Tedi Supriyadi-Universitas Pendidikan Indonesia (Indonesia University of Education) (5); Tatang Muhtar-Universitas Pendidikan Indonesia (Indonesia University of Education) (4); Adang Suherman-Universitas Pendidikan Indonesia (Indonesia University of Education) (4); Ayi Suherman- Universitas Pendidikan Indonesia (Indonesia University of Education) (4); Syahrial Bakhtiar-Universitas Negeri Padang (Padang State University) (2); Dian Budiana-Universitas Pendidikan Indonesia (Indonesia University of Education) (2); Dinar Dinangsit-Universitas Pendidikan Indonesia (Indonesia University of Education) (2); Yudy Hendrayana- Universitas Pendidikan Indonesia (Indonesia University of Education) (2); Hilda Ilmawati-SMAN 1 Batujaya (2); dan Dwi Cahyo Kartiko-Universitas Negeri Surabaya (2)

**Table 2.** Publication Profile in Physical Education Field of Study

No	Keywords	Occurrences	Link	Total Links Strength	Average Publication Year
1	Physical Education	35	40	127	2017.91
2	Students	18	26	84	2018.06
3	Sports	15	25	80	2017.33
4	Education	13	23	70	2017.22
5	Physical Activity	9	23	36	2017.33
6	Teaching	8	20	50	2017.12
7	Education Computing	7	17	36	2018.29
8	Learning Process	6	13	28	2018.00
9	Elementary Schools	5	17	29	2018.60
10	Motivation	4	14	22	2017.75

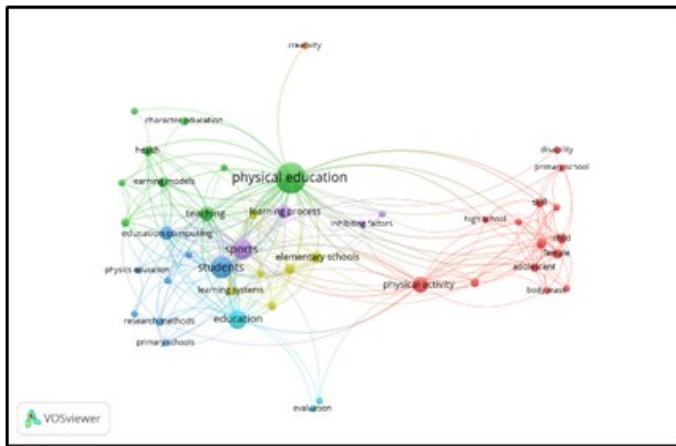
**Source:** Research Data based on Scopus Database (18 January 2021) Analysed by VOSViewer Application.



**Figure 3.** Occurrence Visualization of Keywords in Physical Education  
**Source:** Research Data based on Data from Scopus Database (18 January 2021) Analysed by VOSViewer Application.

learning process', 'elementary school', and 'motivation'. The 10 leading high-frequency keywords and their bibliometric characteristics (including number of occurrences and links, total link strength, and average publication year) are provided in Table 2. The item density visualization of high frequency keywords is presented in Figure 3.

Meanwhile, the co-occurrence analysis of the highest frequency keyword formed thematic groups/ clusters in the field of Physical Education. The groups are shown in Figure 4.



**Figure 4.** Occurrence Network of High Frequency Keywords in Physical Education.

**Source:** Research Data based on Scopus Database (18 January 2021) Analysed by VOSViewer Application.

the number of occurrences of these keywords. It means that the larger the circle on a keyword, the more often it appears.

The visualization in Figure 4 can be identified into 6 thematic clusters, namely: (1) physical activity of school pupils; (2) sports; (3) physical education; (4) health; (5) education; and (6) creativity. Items categorized into identified thematic clusters are presented in Table 3. Keywords written in bold are the keywords with the highest number of occurrences.

**Appearing Topic: Physical Education**

VOSViewer application provides a visualization of a range of topics developing year to year. Figure 5 presents blue, green, and yellow colors. Each color indicates publication year of the article. Blue color indi

**Table 3.** High Frequency Group of Keywords Associated with Physical Education Publications

Cluster Number/ Label / Colour	Number of Keywords	Keywords (Occurrence)
Group 1/ Physical Activity of School Pupils/ Red	14	Adolescent (3); body mass (2); child (4); disability (2); female (4); high school (2); human experiment (2); Indonesia (3); learning (2); male (4); obesity (2); physical activity (9); primary school (2); dan skill (3)
Group 2/ Sports/ Green	12	Character values (2); elementary schools (5); experimental methods (3); inhibiting factors (2); learning activity (2); learning motivation (2); learning process (6); learning systems (4); motivation (4); physical education teachings (3); sports (15); dan teaching (8)
Group 3/ Physical Education/ Blue	11	Character education (3); descriptive analysis (2); e-learning (2); education computing (7); learning models (4); physics education (2); physics (2); physical education (35); primary schools (2); research methods (3); students (18)
Group 4/ Health/ Yellow	5	Cooperative learning (2); health (4); junior high schools (3); learning outcome (2); dan teacher (2)
Group 5/Education/Purple	5	Cooperative learning (2); health (4); junior high schools (3); learning outcome (2); dan teacher (2)
Group 6/ Creativity/Tosca	5	Cooperative learning (2); health (4); junior high schools (3); learning outcome (2); dan teacher (2)

**Source:** Research Data based on Scopus Database (18 January 2021) Analysed by VOSViewer Application.

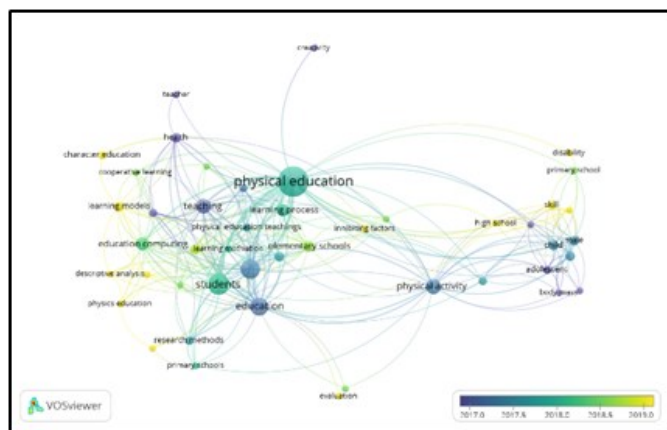
In Figure 4, keywords are grouped based on their relevance. It means that the closer the presence of keywords, the closer the relationship is. A close relationship is indicated by the presence of lines among keywords, while the size of the colorful circles indicates

ates the beginning of the publication year. Green to yellow indicates the latest publication year of the article.

The overlay visualization shows that the majority of keywords with the most recent publication date



(visualized in yellow) are from cluster 1 and cluster 3 and are placed on the right side of the map. Meanwhile, Clusters 2, 4, 5, and 6 classify keywords with the earliest average publication year (visualized in dark blue). To complete the picture and identify topics appearing in publication, we searched for keywords with the most recent publication date (2014, 50, and so on) and sort them in Table 4. Bibliometric characteristics used for further analysis included: average publication year, the



**Figure 5.** Average Publication Year of High Frequency Keywords in Physical Education Publications  
**Source:** Research Data based on Scopus Database (18 January 2021) Analysed by VOSViewer Application.

number of occurrences, links, and total link strength.

Keyword analysis, with the most recent publication date, shows the following emerging topics in the field of Physical Education research: 1) Physical activity at school age (manifested by keywords 'physical activity', 'adolescent', 'primary school', 'male', and 'female), 2) teaching Physical Education and its learning model (manifested by keywords 'learning models', 'physical education', 'students', and 'education computing '), 3) learning activities and learning motivation (manifested by keywords 'learning motivation', and 'learning activity'). Further keyword discovery shows the research activity manifested in keywords 'research methods', 'human experiment', and 'experimental method'.

**DISCUSSION**

The findings show that the collected research results were scattered in engineering (21), social sciences (18), and materials science (14) subject areas. The presence of engineering as the highest subject area was due to the fact that many articles were published in publications, both journals and proceedings, with engineering

**Table 4.** Bibliometric Characteristics of Recent Keywords from Publications in Physical Education (Sorted by Date of Publication)

Keyword	Average Publication Year	Occurrences	Links	Total Link Strength	Group
Evaluation	2020.00	2	2	2	5
Character Education	2019.33	3	2	4	3
Learning Models	2019.00	4	14	17	3
Learning System	2018.75	4	14	23	2
Elementary Schools	2018.60	5	17	29	2
Cooperative Learning	2018.50	2	8	9	4
Education Computing	2018.29	7	17	36	3
Students	2018.06	18	26	84	3
Learning Process	2018.00	6	13	28	2
Physical Education	2017.91	35	40	127	3
Motivation	2017.75	4	14	22	2
Physical Activity	2017.33	9	23	36	1
Sport	2017.33	15	25	80	2
Education	2017.22	13	23	70	5
Teaching	2017.12	8	20	50	2
Junior High School	2017.00	3	11	20	4
Teacher	2016.50	2	2	2	4
Health	2016.25	4	12	21	4
Body Mass	2015.50	2	7	11	1
Creativity	2015.00	2	1	2	6
Obesity	2014.50	2	6	6	1

**Source:** Research Data based on Scopus Database (18 January 2021) Analysed by VOSViewer Application.

theme (scope). The data found that there were 21 documents published in Engineering journals and proceedings. Fourteen of them were published in the IOP Conference Series Materials Science and Engineering, where the conference only accepts articles in the engineering scope. Interestingly, the 21 published documents combined Physical Education research theme and Engineering research theme, for example a research conducted by (Suherman et al., 2018) entitled "The development of instructional media for rhythmic gymnastics in Physical Education course" where the study aimed to develop learning media for rhythmic gymnastics by the help of tools and musical instruments. Development of materials, in the form of tools and musical instruments, was included in engineering scope. However, there were many published articles outside engineering scope of the IOP Conference Series Materials Science and Engineering. The examples include "Identifying students' learning performance as a way to determine the admission process in the Physical Education field" (Prihanto et al., 2018), "Character based Physical Education model" (Suherman et al., 2017), "Tactical approach to increase motivation for learning students on Physical Education teaching in primary schools" (Rokhayati et al., 2017), and "Predictors of Physical Activity Amongst Women Students of Teacher Education for Primary Education at Indonesia University of Education, Sumedang Campus" (Dinangsit, 2017). By conducting further analysis, each of these articles was outside Engineering scope. Apart from these facts, it is expected that there will be cross-scientific research collaborations between the field of Physical Education and Engineering (both information engineering and mechanical engineering) which will result in a research with high novelty requirements.

This research is a research with a bibliometric approach aimed to analyze and map the trending research and publications, especially in the field of Physical Education. The findings show that there were 6 thematic clusters identified by the co-occurrence analysis methodology with the help of the VOSViewer application. The focus of the theme of the first cluster was physical activity at school age. Physical activity at the school age level has become a concern (Setyorini et al., 2017), especially in Indonesian regions which continue to strive to increase physical activity in various ways, one of which is the Sport Education Model (SEM) (Ginanjari, 2019).

The focus of the second cluster theme was sports and learning, which was indicated by the frequent appearance of the "sports", "teaching", and "learning process" words. This theme is interesting because it discusses Physical Education in schools and sports. Physical Education is defined as physical activity which can be then interpreted as sports activity (Abduljabar, 2017). Although sport is a high skill achievement, actually, sport is also a form of physical activity; most people say that sport is also a physical activity (Abduljabar, 2017). On the other hand, Physical Education is defined as education, which means that Physical Education teaches all kinds of physical activities to bring students to become physically educated people. This learning made students to be physically educated (Abduljabar, 2017). Both meanings come from physical activity as performance and physical activity as a learning process. Edwards (2010) states that there is a difference between performance and learning. From the physical activity and sports point of views, it is related and difficult to clearly understand.

The focus of the third cluster theme was sports learning which was indicated by the frequent keywords of words "physical education", "students", and "education computing". The applied learning is also an effort to develop and improve motor skills, one of which is based on local excellence (Widyaningsih et al., 2019). Furthermore, (Tarigan et al., 2017) also investigated the implementation of a scientific approach in Physical Education learning to improve physical fitness of junior high school students living in coastal areas. Other studies state the effectiveness of a learning supported by facilities and infrastructure (Mulyana & Suherman, 2017). It shows that the thematic learning in Physical Education continues to develop with various approaches.

## CONCLUSION

This study conveys to the public that mapping through bibliometric analysis contributes to a better understanding of the publication development patterns in the field of Physical Education. By finding thematic areas and topics appearing in publications, this study delivers information on important issues for further research, theory development, and educational practice. The findings show that Physical Education is a research area that still needs to be developed, referring to the

productivity of publications from 2013 to 2020 where the publication range was still below 15 per year. The collected research results were scattered in the fields of engineering studies (21), social sciences (18), and materials science (14). The main contributor to the publication was Universitas Pendidikan Indonesia (24), the most productive author was Tedi Supriyadi from Universitas Pendidikan Indonesia. In Physical Education publications, six major thematic groups were identified, namely: (1) physical activity of school pupils; (2) sports; (3) physical education; (4) health; (5) education; and (6) creativity. The most contributed publication media was the IOP Conference Series Materials Science and Engineering with 14 published documents.

## HIGHLIGHTS

- Physical education is a research field that still needs to be developed, referring to the productivity of publications from 2013 to 2020, where the range of publications was still below 15 per year.
- The collected research results were scattered in the fields of engineering studies (21), social sciences (18), materials science (14).
- The main contributor to the publication was Universitas Pendidikan Indonesia (24). The most productive author was Tedi Supriyadi from Universitas Pendidikan Indonesia.
- In Physical Education publications, six featured thematic groups were identified related to: (1) physical activity of school pupils; (2) sports; (3) physical education; (4) health; (5) education; and (6) creativity.
- Topics appearing in Physical Education publications, which had recently attracted the academics, included the following issues: (1) Physical Education teachers and their training/education, (2) Physical Education in the context of higher education, and (3) Physical Education in the context of secondary education.
- The most contributing publication media was the IOP Conference Series Materials Science and Engineering with 14 published documents.

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