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Bibliometric Analysis: Contructivism Approach in Junior High School Geometry Learning in Indonesia (2017-2023)

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Abstract

Constructivism is a learning theory perspective that strongly influences how mathematics is learned. Since secondary school students are just beginning to recognize and understand abstract thought processes, it is not appropriate to educate them through meaningless memorization, especially in mathematics which is full of abstract symbols. The writing of this article aims to find out the research trends regarding the constructivism approach and to find out the research themes that have the opportunity to be used as research in the future. The method in this research is using bibliometric analysis. Research data obtained through Harzing's Publish or Perish software with Google scholar database, keywords constructivism and junior high school geometry and the result of the maximum number "1000", the article obtained as many as 996 articles with a period of 2017-2023. Then limited to accredited journals sinta 2 obtained 50 articles. The results showed that the publication trend with the research theme of the constructivism approach experienced the highest increase between 2017-2020. In addition, the theme of research on the constructivism approach that has the opportunity to be used as research in the future there are four keywords, namely constructivism and Realistic Mathematics Education (RME).

INTRODUCTION

As minister of education and culture, Mr. Nadiem Makarim introduced a new strategy known as the autonomous learning program as a response to the state of education in Indonesia, which is crucial to developing the country's future generation of quality. A form of education known as autonomous learning upholds the independence of teachers and students. [1]. In constructivist learning theory, the idea of self-directed learning is relevant. From a constructivist perspective, children construct their knowledge through their interaction with objects and situations they encounter [2].

Constructivism gives students the freedom to create their own knowledge of the subject matter, making the learning process happier and more enjoyable. Students using this method should overcome challenges when educational tasks or exercises are real or authentic in nature [3]. This is important to support students' metacognitive skills, which includes asking follow-up questions and providing more context for their responses.

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Arithmetic, algebra, geometry, and analysis are the four main branches of mathematics. Of the four mathematical disciplines, geometry is one of the disciplines that must be mastered by junior high school children because geometry is a subject that they encounter daily and has an important place in our curriculum.

In terms of theory, analysis and problem solving, Indonesian students scored very poorly, according to the findings of the 2011 TIMMS study. In addition, evaluating the findings of the TIMSS study and clarifying that only 20% of Indonesian students were able to accurately answer one of the questions. Solving geometric puzzles involving the notion of parallelogram and perimeter of a rectangle. The research findings show that most students still have difficulties in answering geometry-related tasks [4].

Given the background information provided, the purpose of this study to determine the approach of constructivism in learning geometry junior high school, the need for further literature review in order to be more specific. Based on the problems that have been described, so the formulation of the problem of this study is How the trend of research on the approach of constructivism in learning geometry junior high school. What themes regarding the approach of constructivism in learning geometry junior high school that has the opportunity to be used as research in the future. The purpose of this study is to know the research trends contructivism approach in learning geometry junior high school and know the theme of research contructivism approach in learning geometry junior high school that has the opportunity to be used as research in the future.

METHODS

The method in this research is using bibliometric analysis. Bibliometrics is a statistical technique for analyzing publications in a certain topic that includes publication-related data [5] . Bibliometrics can make it easier to obtain metadata [6]. Bibliometric measurements include the number of literature publications, number of authors, number of citations, understanding current research trends to evaluate the influence of research. Furthermore, the google scholar database is used in finding the necessary data sources with the PoP application. The data used is limited to sinta 2 accredited journals. The acquired data is compiled into a single file in both RIS and CSV formats, which is subsequently opened in the VOSviewer program. Subsequently, the researchers employed the VOSviewer application to examine, display, and assess all available data regarding publications pertaining to the constructivism method of teaching junior high school geometry, including co-occurrence of author keywords and country, institution, and journal bibliographic pairs. Country bibliographic pairs were not included in this analysis because our focus was solely on ethnomathematics research in Indonesia.

Publish or Perish software is used to search for articles related to "Controctivism Approach in Junior High School Geography Learning" which will obtain metadata and then selected according to certain criteria. [7]. Article sorting was conducted on January 5, 2024 with the keywords of constructivism and junior high school geometry in the period 2017-2023 .

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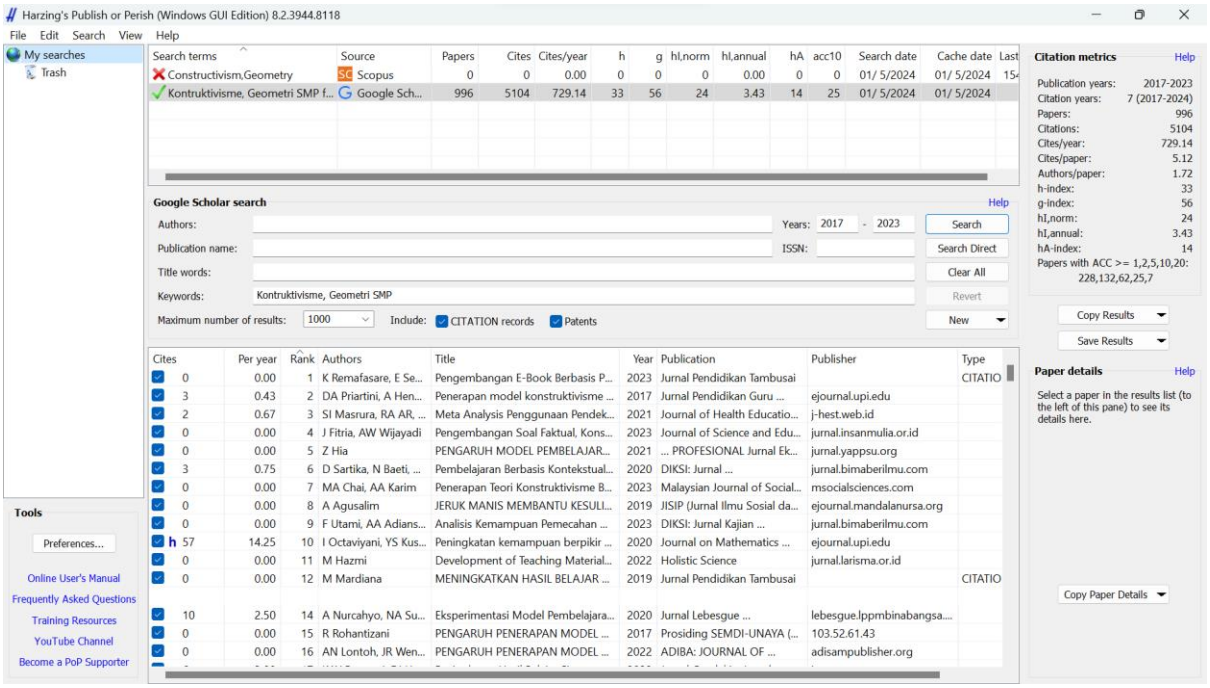

Figure 1. Metadata Search through PoP

RESULTS AND DISCUSSION

When showcasing the bibliometric analysis findings in this research, make reference to [8] beginning with the quantity of publications and citations from various nations, organizations, publications, writers, and the frequency of related terms. Due to the fact that this bibliometric analysis research was limited to a single nation, Indonesia, the researchers began in accordance with the needs, counting the number of publications and citations from journals, institutions, and documents. Next, they examined the data from the analysis of the occurrence of shared keywords, which was visualized using VOSviewer. 50 articles were obtained from the 996 items that were restricted to two recognized journals based on the information created by the PoP search. Table 1 presents an annual breakdown of the quantity and distribution of article publications.

Table 1. Number and percentage of publications of constructivism approach in junior high school geometry learning (2017-2023)

Number	Year of Publication	Number of Publications	Percentage
1	2023	4	8%
2	2022	9	18%
3	2021	8	16%
4	2020	10	20%
5	2019	9	18%
6	2018	5	10%
7	2017	5	10%

As can be seen from the above table, 2020 will have the most publications annually (12 publications, or 20%) of any year. The number of publications increased from 2019—when there were just 10—and then fell in the years that followed. Of the 50 publications, the majority are

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from journals or articles accredited by Sinta 2 that are frequently cited or used as references in other studies. This indicates that the more times a document is cited or has its citations counted, the more frequently its research findings are cited in other studies [9]. Because of this, we used the quantity of documents and publications in ranked journals and institutes.

Documents published in national periodicals that use constructivism to teach geometry to junior high school students are indexed by Sinta 2. Researchers utilize the VOSviewer tool to examine journal bibliographies of the 50 papers that have been gathered. Based on the quantity of documents received, they next sort the certified journals according to the table that follows.

Table 2. Institutions or universities with the number of publications and citations of constructivism approach in junior high school geometry learning

Number	Journal Name	Number of Documents	Number of Citations
1	AKSIOMA:Jurnal Pendidikan Matematika	28	5
2	MUSHOFARA:Jurnal Pendidikan Matematika	8	17
3	Jurnal Riset Pendidikan Matematika	7	15
4	PYTHAGORAS:Jurnal Pendidikan Matematika	7	15

From table 2, it shows the trend of journals with the number of documents in sinta 2 accredited journals. The journal Aksioma: a journal of mathematics education is at the top with 28 documents and 5 citations. This indicates that study findings about the constructivism approach align with the scope and focus of the aforementioned journals, making it beneficial for scholars seeking to publish research papers on the constructivism approach.

Published from various institutions or universities, the Sinta 2 indexed papers are relevant to the constructivism approach in junior high school geometry in Indonesia. The table below displays the distribution of colleges or universities based on the quantity of publications and citations received.

Table 3. Institutions or universities with the number of publications and citations of constructivism approach in junior high school geometry learning

Number	Journal Name	Number of Documents	Number of Citations
1	Muhammadiyah Metro University	28	5
2	Institut Pendiidkan Indonesia Garut	14	17
3	Yogyakarta State University	14	15

The Table 3 shows that Muhammadiyah Metro University tops the list with 28 documents and 5 citations, followed by Indonesian Institute of Education Garut in second place with 14 documents and 17 citations. Finally, Yogyakarta State University with 14 documents and 15 citations. In the 3 institutions or universities above, 1 institution or university comes from the island of Java, namely, Yogyakarta State University and the Indonesian Institute of Education

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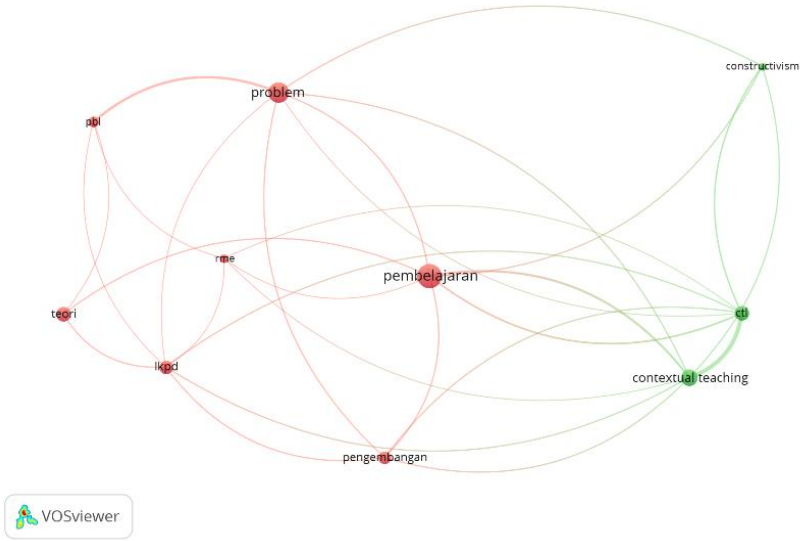
Garut , while 1 other institution comes from outside the island of Java, namely Muhammadiyah Metro University. Two of the three institutions with the highest number of documents come from outside Java. This indicates that there are still not many research findings that address the use of constructivism in junior high school geometry instruction at universities and other institutions on Java's neighboring islands.

Sinta 2 indexes articles published in national and international periodicals that discuss the constructivism method of teaching geometry to junior high school students. The documents listed in the following table have more than ten citations.

Table 4. Most number of publications and citations on constructivism approach in junior high school geometry learning

Number	Author	Title	Year	Journal Name	Number of Citations
1	Caka Gatot Priambodo, Aulia Ar Rakhman Awaludin, Nur Alamsyah	Pengembangan Perangkat Pembelajaran Berbasis Konstruktivisme Dengan Multimedia Interaktif Untuk Mengajarkan Konsep Matematika	2017	AKSIOMA:Jurnal Pendidikan Matematika	17
2	Gunawan	Pengembangan Perangkat Pembelajaran Matematika Berbasis Konstruktivisme	2017	PYTHAGORAS: Jurnal Pendidikan Matematika	15

In the Table 4, it can be seen that the document with the title Development of Constructivism-Based Learning Tools with Interactive Multimedia to Teach Mathematical Concepts[10] with 17 number of citations. In second place is the document with the title Development of Mathematics Learning Tools Based on Constructivism [11] with 15 total citations . Documents - the above documents can be used as a reference for further research that takes the theme of constructivism approach in learning geometry junior high school. Data that has been obtained from PoP software is combined with RIS format in one file, then the file is inserted into the VOSviewer software to get the results of bibliometric analysis.



Picture 2. Network visualization of keyword co-occurrence

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Based on Figure 2, network visualization of the occurrence of shared keywords. The most studied cluster is in the red cluster. There are 2 clusters with more detailed keywords from the analysis results using VOSviewer, namely:

1. The red cluster consists of 6 keywords: theory, lkpd, pbl, rme, problem, learning, development.
2. The green cluster consists of 3 keywords, namely contructivism, contextual teaching, ctl.

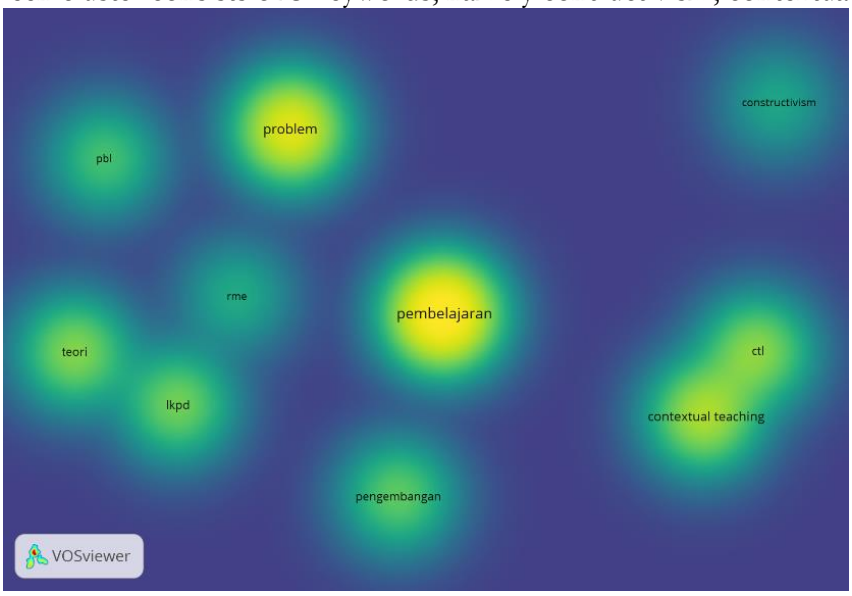

Figure 3. Density visualization

In density visualization, if the density color will get brighter and more detailed, the discussion of the topic has a lot of research. Whereas if the color of the density is fading then this indicates that the discussion of the topic is still a little or rarely research. In Figure 3, the most faded density or can be said to be rarely researched with the research theme of contructivism approach in learning geometry junior high school is contructivism and Realistic Mathematics Education (RME). Contructivism is one that has a density with a fading color where it shows that the theme is still rarely researched. Constructivism is a teaching method that gives students the freedom to construct their own knowledge by using a learning model designed by the teacher [12]. Characteristics in the implementation of constructivism approach in learning activities include active learning, factual and situational learning, interesting and demanding learning activities, students' ability to connect newly learned material with prior knowledge, the ability to reflect on the material learned, the increasing role of the teacher as a facilitator who can support students in building knowledge, and the teacher's capacity to provide the scaffolding students need to succeed in the learning process [13].

CONCLUSION

In this study, it can be concluded that there are 996 articles obtained from searching using the keyword "Mathematics Concept" using Publish or Perish (PoP) software with the Google Scholar database. Furthermore, the publication of articles is limited by using Sinta 2 accredited articles. Then for the most articles is AKSIOMA with the most publishers who publish articles, namely 28 articles. There is an article with the highest citation entitled "Development of Constructivism-Based Learning Tools with Interactive Multimedia to Teach Mathematical

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Concepts". This article was written by Caka Gatot et al in 2017 with 17 citations and published by AKSIOMA. Visualization of the relationship between keywords constructivism and junior high school geometry is most widely used in the keywords "Problem" and "Learning" and there are 10 keywords from 2 clusters. For visualization of density with the research theme of constructivism approach in learning geometry junior high school and still rarely researched is constructivism and Realistic Mathematics Education (RME). So it can be concluded that the research theme of constructivism approach in learning geometry junior high school that has the opportunity to be used as research in the future there are four keywords namely constructivism and Realistic Mathematics Education (RME). For future researchers in data retrieval can use databases other than Google Scholar (using Scopus), besides that keywords can be more detailed again to further maximize the results of bibliometrics.

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