

Literature Review

Bibliometric: The Role of Science Learning on Student Motivation in Moral Education

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ABSTRACT

The purpose of this research was to find out the development and understanding of the role of science learning on students' motivation in moral education using a bibliometric study on the Google Scholar database with the help of VOS viewer. From 2019 to 2023, 953 articles were found from Google Scholar, and 795 were selected, which were related to content, based on data collection results using the keywords "science learning", "student motivation", and "moral education". The results of data searches for the last five years show that from 2019 to 2023, the number of publications has decreased. Three types of visualizations in the data mapping analysis were added: network visualization, overlay visualization, and density visualization, to support the analysis of related articles. It is hoped that the results of this study will help researchers identify developments and understanding of international research related to the keywords proposed.

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1. INTRODUCTION

Education in a broad sense is a process of developing one's view of life, attitude of life, and life skills. Efforts to develop these three aspects can be done at school, outside of school, or within the family. Science learning is a field of study that requires an understanding of abstract concepts and problem-solving, so through science learning, students have the opportunity to acquire the knowledge and skills needed to understand and face the challenges of the modern world (Kipper et al., [2021](#); Saravanakumar, [2020](#); Zidny et al., [2020](#)). In the last ten years, new communication and information technology have significantly changed human life (Yamin, [2019](#)). Science is a resource as a scientific discipline that can offer analytical methods to become more general in an instant to solve complex problems facing humanity from a global and historical perspective (Zidny et al., [2020](#)).

The aspect of science is dynamic, meaning that it always develops and increases all the time, so that by studying science, we indirectly keep up with the times (Ruiz et al., [2021](#)). Science learning is expected to be a vehicle for students to learn about themselves and the environment, as well as provide opportunities to apply it in everyday life (Seow et al., [2019](#); Struyf et al., [2019](#)). The learning process emphasizes giving direct experience to students to gain the ability to explore and understand the natural surroundings scientifically (Dewi & Primayana, [2019](#)). Education is said to be complete when it leads to the growth of the individual as a whole, which includes not only mental development but also moral development (Asif et al., [2020](#)), because in the current era of globalization, technological developments are very rapid, so that the position of moral

education becomes increasingly crucial in equipping the younger generation with strong moral values and good ethics (Harmadi et al., 2022; Jumaevich et al., 2021; Utamirohmahsari, 2024).

According to Article 3 of Law Number 20 of 2003 concerning the National Education System (SISDIKNAS), educational development is intended to develop capabilities and form dignified national character and civilization in the framework of educating the nation's life (Latief et al., 2021). The purpose of national education is to develop the potential of students to become believers and fearful of the One God, worthy, healthy, knowledgeable, and knowing (Bakri et al., 2022; Hadi, 2019).

Moral education is the process of teaching students ethical values, virtues, and responsible behavior to help them make sound decisions and contribute positively to society. It emphasizes the development of moral reasoning, empathy, and respect for others' rights. By nurturing emotional and social growth, moral education aims to shape individuals into responsible and compassionate citizens. This moral is very important for every individual, as Kohlberg opened the eyes of psychologists and educators to the fact that a person's moral thinking changes as they grow, and that these changes continue to follow predictable stages of development as they age (Snarey & Green, 2011).

Moral education not only focuses on the academic aspects, but also considers the moral, social, and emotional development of students (Hidayati et al., 2020). However, moral education also plays a role in shaping the character of students. It is necessary to start with a more general approach to moral growth and move to a more focused approach on capacity development. Such abilities should be considered as a virtue or personality trait that allows the student to live well, or be a good person (Hariyadi et al., 2022; Lavy, 2020). Thus, through moral education, students are taught to appreciate differences, develop empathy, and respect the rights of others (Walia, 2022). A strong and good character will help students face difficulties in learning Science, including when they experience failures or mistakes. They will have the motivation to keep trying and not give up easily (Henry et al., 2019; Struyf et al., 2019).

One source that supports the important role of moral education in student motivation in Science learning is research conducted (Chowdhury, 2016). In their research, they found that students who received a good moral education tended to have a higher level of motivation in school learning (Muis et al., 2019). They assert that moral education helps students develop values such as integrity, responsibility, cooperation, and concern for the environment (Begum et al., 2022; Seow et al., 2019).

In addition, other relevant research conducted by Sani et al. (2019) in this study highlighted that students who take part in science-based learning programs have greater motivation both from within and from outside, so that good morals are instilled (Sani et al., 2019). They also found that students who had a strong understanding of moral values performed better in science subjects (Chowdhury, 2016; Sahin & Yilmaz, 2020).

In this article, we choose a bibliometric analysis to enable one to observe the progress of the field in question, and the changing gravity of the topic under consideration. Bibliometric techniques using other references can be applied to build statistical models of scientific communication flows. for example, to link documents, journals, or other scientific lines of communication. The results of citation analysis are used for many purposes, for example, to determine the impact of a particular article or journal on future research and to document the interdisciplinary application of various journals in compiling a literature study (Khan et al., 2021; Muhuri et al., 2019). The purpose of this study is to conduct a bibliometric analysis of research related to the importance of Science learning to student motivation in moral education by referring to several relevant sources in the field of education.

2. METHOD

The study presents a bibliometric analysis of the literature on the importance of science learning to student motivation in moral education. The illustration of the design phases of the methodology related to bibliometric analysis and detailed information for experiments in this study covers three stages, namely:

2.1 Selecting data

Selection of research article data is done by collecting related articles that have been published using the Google Scholar database and using the Publish or Perish software. We collected data on June 1, 2023. The data search was carried out at the last 5-year level, from 2019 to 2023. The keywords used in the search for related articles were "science learning," "student motivation," and "moral education". Document searches are filtered by document type in the form of journals, conference proceedings, and books, but we exclude patents. The results of data collection found 953 research articles about the importance of learning science to students' motivation in moral education. The articles are then entered into Microsoft Excel software and stored in a comma-separated value format (*.csv). Google Scholar is one of the largest free scientific bibliographic databases, and Google Scholar collects many databases whose content is not accessible via the public internet. Not only that, Google Scholar covers a multidisciplinary field, enabling it to reach a wide range of data (Levine-Clark & and Gil, 2008; Walters, 2007). Therefore, Google Scholar was chosen as the database in the

bibliometric analysis. So, Google Scholar is comparable to Web of Knowledge (edited by ISI/Thomson) and Scopus (created by Elsevier), both of which are expensive sources of scientific bibliographies.

2.2 Data filtering

Data filtering is required because the data collected and obtained cannot be analyzed directly. At this stage, data screening is done by looking at the title and year of publication of each article. Articles with irrelevant titles and incomplete years of publication were discarded. After the data was cleaned, a Microsoft Excel file was generated for analysis using bibliometric software. Then 795 articles were found that met the requirements for further analysis after screening the data.

2.3 Analyses and visualize data

The Microsoft Excel program can be used to convert the .ris document format, which has been cleaned and stored. Then, after that, open it and see the data. The VOS viewer bibliometric analysis software is used to analyses the development and understanding of the role of science learning on students' motivation in moral education. At this point, we chose the words used in the VOS viewer network mapping visualization. Source databases are used to map article data. And there are three types of data mapping that we use: network, density, and overlay visualization. Detailed information for data analysis and visualization using VOS viewer and Publish or Perish software is described elsewhere (Husaeni et al., [2022](#)).

3. RESULTS AND DISCUSSION

Various studies on science learning on students' motivation in moral education have determined the level of publication. The data after the screening process through the Publish or Perish software resulted in 795 articles from various institutions in the world. Figure 1 shows the trend of published documents on the importance of learning science on students' motivation in moral education from 2019 to 2023. The number of publications decreased from 2021 to 2023. The number of articles from 2019-2023 is 319, 319, 134, 18, and 5 articles each. 2019 to 2020 saw the highest trend rate for science-related learning publications towards student motivation in education. The lowest trend rate of publication in 2023 is only 5 articles. Because learning has migrated to technology and its rapid development, it is necessary to expect and pay attention to the moral role of students in the world of education, especially in learning science, to motivate them to become more useful and intelligent to face the challenges of the world today. Because learning has migrated to technology and its development is very rapid, it is necessary to expect and pay attention to the moral role of students in the world of education, especially in science learning, to motivate them to be more useful and intelligent in responding to the challenges of today's world.

In publication trends, the number of publications produced may change, and this is normal. The cause may be a shift in research focus, where research related to "The Role of Science Learning on Student Motivation in Moral Education" may have been replaced by new or more specific trends in the field of education or science. This is in line with other researchers' statements that dynamic changes in research trends are normal (e.g., Coccia & Rolfo, [2008](#); Saari & Miettinen, [2001](#)). For example, the COVID-19 pandemic has impacted nearly every field, including education and research. Many researchers have had to adapt their teaching or research methods, which can lead to a decrease in the number of publications or research studies being published.

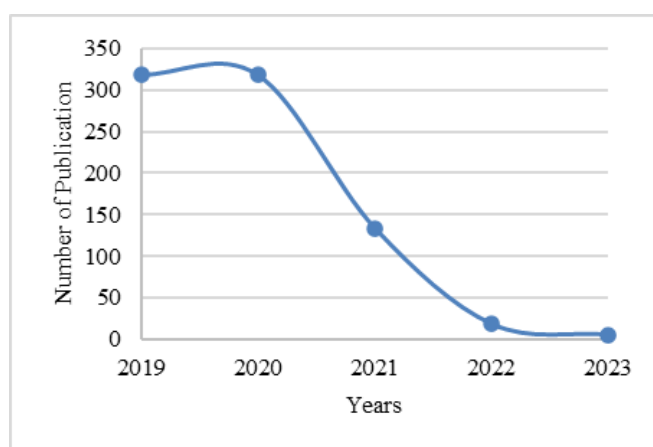


Figure 1. Trends in the Annual Publication of Pedagogic Behavior of Outer Class Students (2019-2023).

Analysis of authors and publications with the most citations is an important factor for analyzing research and research developments in various fields (Wong et al., 2020). Science learning on students' motivation in moral education with 15 selected quotes that are relevant to be a topic of analysis related to content based on the Google Scholar database for the 2019-2023 period presented in Table 1. 15 relevant quotes about Science learning on students' motivation in moral education come from 75% journal articles and 35% publication in books. When viewed from the number of citations, books contributed 37162 citations, while research articles totaled 9301 citations. The most cited publication is the publication of a book entitled "The adult learner: The definitive classic in adult education and human resource development" by Holton et al. (2020). And the most cited journal article excerpt is "Making learning fun: A taxonomy of intrinsic motivations for learning" by Malone & Lepper (2021).

Table 1. 15 selected articles relevant to science learning on students' motivation in moral education.

No	Author and Year	Title	Publisher	Publication type	Citation
1	(Knowles et al., 2005)	The adult learner: The definitive classic in adult education and human resource development.	Abingdon, Ninth edition	e-book	25081
2	(Collins et al., 2019)	The credential society: An historical sociology of education and stratification	Columbia University Press.	e-book	6482
3	(Malone & Lepper, 2021)	Making learning fun: A taxonomy of intrinsic motivations for learning	Aptitude, learning, and instruction	Article of Journal	4004
4	(Bean & Melzer, 2021)	Engaging ideas: The professor's guide to integrating writing, critical thinking, and active learning in the classroom.	John Wiley & Sons.	e-book	2927
5	(Darling-Hammond et al., 2020)	Implications for educational practice of the science of learning and development	Applied developmental science	Article of Journal	2012
6	(DeBoer, 2019)	A history of ideas in science education	Teachers college press.	e-book	2012
7	(Fitriyani et al., 2020)	Motivasi belajar mahasiswa pada pembelajaran daring selama pandemik covid-19	Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran	Article of Journal	906
8	(Schunk & DiBenedetto, 2020)	Motivation and social cognitive theory	Contemporary Educational Psychology	Article of Journal	736
9	(Margot & Kettler, 2019)	Teachers' perception of STEM integration and education: a systematic literature review	International Journal of STEM education	Article of Journal	651
10	(Heritage, 2010)	Formative assessment: Making it happen in the classroom	Corwin Press.	e-book	514
11	(Aldowah et al., 2019)	Educational data mining and learning analytics for 21st century higher education: A review and synthesis	Telematics and Informatics	Article of Journal	435
12	(Makransky et al., 2019)	Motivational and cognitive benefits of training in immersive virtual reality based on multiple assessments	Journal of Computer Assisted Learning	Article of Journal	276
13	(Jeynes, 2019)	A meta-analysis on the relationship between character education and student achievement and behavioral outcomes	Education and Urban Society	Article of Journal	165
14	(Wamsler, 2020)	Education for sustainability: Fostering a more conscious society and transformation towards sustainability	International Journal of Sustainability in Higher Education	e-book	146
15	(Anderman, 2020)	Achievement motivation theory: Balancing precision and utility	Contemporary Educational Psychology	Article of Journal	116

Figure 2 shows the relationship between terms. The co-occurrence visualization map successfully grouped keywords into clusters of different colors that were grouped into 4 cluster items representing a major research area consisting of 44 items, 547 links, and a total link strength of 1087. Some general irrelevant and

frequently occurring terms without special meaning were flagged in the program with low relevance scores and were thus excluded from the analysis. Figure 2 depicts a term map based on the frequency of shared occurrences, with the four groups of related concepts depicted in different colors.

In the network, each node functions as an entity (such as articles, authors, countries, institutions, keywords, journals, etc) (Donthu et al., [2021](#)), and in cases such as those depicted in Figure 2, there are many descriptions, among others:

- (i) The occurrence of keywords is indicated by the size of the color node.
- (ii) The node relationship shows the co-occurrence between keywords.
- (iii) Co-occurrence of keywords is indicated by the link number.
- (iv) The bigger the node, the bigger the keyword appears.
- (v) The thicker the links between nodes, the greater the co-occurrence between keywords.
- (vi) Each color indicates a thematic group. Topics (nodes) of themes (groups) and relationships (links) between topics (nodes) underneath can be described through nodes and links within groups.

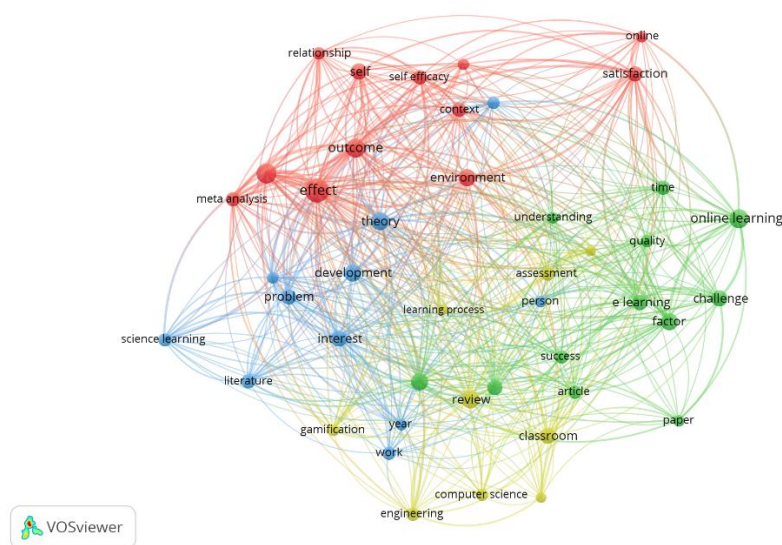


Figure 2. Network visualization in science learning on students' motivation in moral education.

Research related to Science Learning on students' motivation in moral education based on mapping visualization is divided into 4 clusters, among others:

- (i) Cluster 1:
Cluster 1 in red corresponds to 12 items, including: achievement, character education, context, effect, environment, meta-analysis, online, outcome, relationship, satisfaction, self, and self-efficacy. Based on the literature, this cluster refers to students' motivation in learning science, which aims to increase students' awareness of themselves through moral education that they face themselves in everyday life, decision making, and the environment through direct observation. In addition, with the science learning that underlies it about the surrounding nature, it can also help improve moral education because the encounter with nature becomes holistic, with knowledge and experience interacting with all the senses (van Kraalingen, [2023](#)).
- (ii) Cluster 2:
Cluster 2 is green, which is related to 12 items such as article, challenge, e learning, factor, online learning, paper, process, quality, success, systematic review, time, and understanding. Cluster 2 groups based on the learning system used in schools or the teaching and learning process, so that it is able to make the topic of this article. As an example, the processes, challenges, and qualities listed in the cluster describe how the processes and challenges that take place in teaching and learning in schools and universities make quality a standard of learning to increase student motivation in learning science.
- (iii) Cluster 3:
Cluster 3 has a blue color associated with 11 items such as ability, development, interest, literature, person, problem, science education, science learning, theory, work, and year. Cluster

3 classifies based on scientific aspects in educational learning, so that it is related to the development of students' knowledge in improving moral education in terms of several related scientific factors.

(iv) Cluster 4:

Cluster 4 is marked with a yellow node which contains 9 items such as assessment, case study, classroom, computer science, engineering, gamification, learning process, review and student learning. Cluster 4 is related to the learning process at school, so it can be related to the existence of a science learning process at school to increase student learning motivation in the moral education of students.

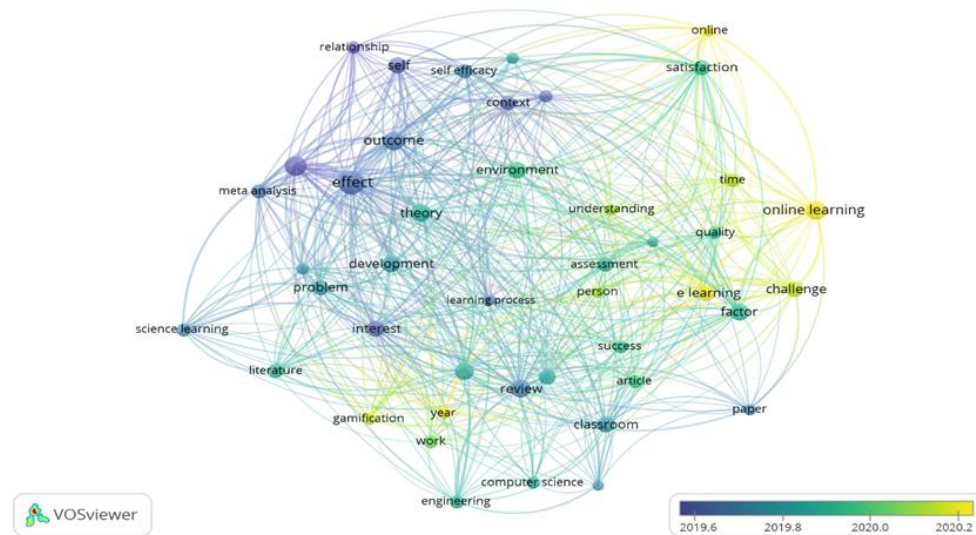


Figure 3. Overlay visualization of science learning on students' motivation in moral education.

Figure 3 shows research trends on related topics per year in scientific publications from 2019 to 2023. Overlaid visualization images show that solid colours show the results of many studies that have been done, and bright colours show the latest research that has been done (Husaeni et al., [2022](#)). Based on Figure 3, when viewed from the latest research in 2019 (see yellow node in Figure 3), research and publications related to the importance of learning science to students' motivation in moral education are starting to lead to research on challenges, online learning, and personal understanding. This is based on the visualization results showing the yellow dot, which represents the last years of publication of scientific publications (Chen & Song, [2019](#)).

The results of the density visualization are shown in Figure 4. The density visualization shows the depth of the goods density visualization (Haghnazar Koochaksaraei et al., [2021](#)). In the density visualization, each item point has a certain color indicating the density of the item at that point; by default, these colors range from blue to green and yellow. If there are more items around the dot and the items are heavier, the dot's color becomes more yellow. By noting which parts of the items are considered important for analysis, this section is very useful for gaining an understanding of the general structure of a bibliometric map (Gan et al., [2022](#)). Through this analysis, researchers can interpret the most commonly used keywords in a publication. The darker the colors produced, the more researchers use the keywords "science learning", "student motivation", and "moral education".

Density visualization in VOSviewer is a type of visualization that shows the density of items or concepts in a bibliometric map. Visualization is very useful for illustrating how often certain terms or keywords appear in the analyzed documents. Points or nodes representing terms or concepts are colored based on their density of occurrence. Darker points (or lighter points, depending on the color settings) indicate that the term or concept appears more frequently in the analyzed literature. Conversely, lighter or paler points indicate terms that appear less frequently. In addition, density visualization displays concentrated nodes that represent the appearance of author keywords in the research area we analyzed (Bukar et al., [2023](#); Hatami et al., [2021](#)).

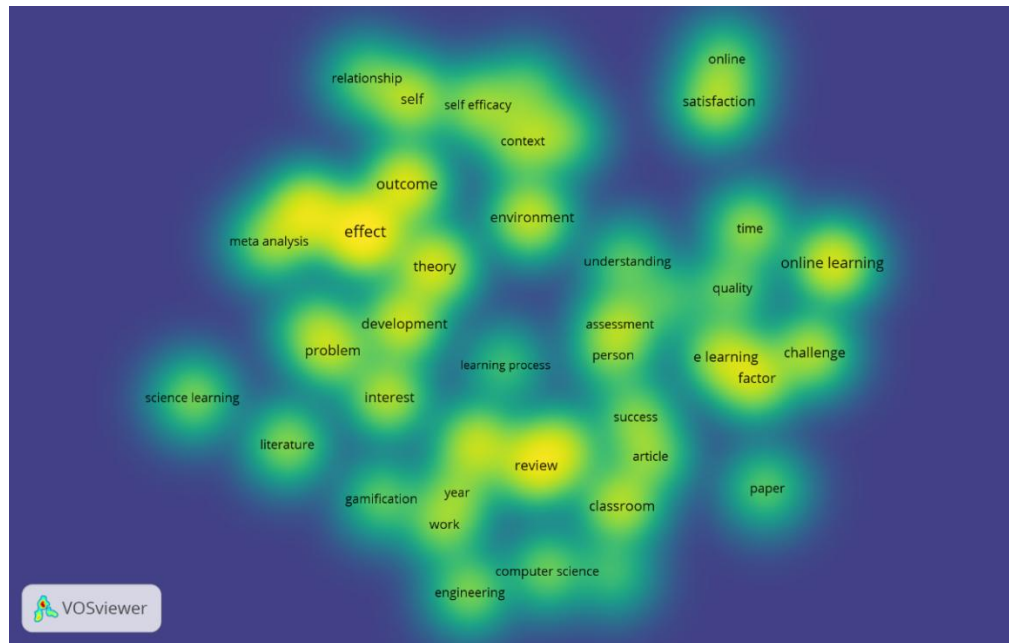


Figure 4. Visualization of Science Learning Density on students' motivation in moral education.

4. CONCLUSION

Based on the analysis of Science Learning research on students' motivation in moral education from 2019 to 2023, the highest number of publications occurred in 2019 and 2020, with 319 published articles. However, the number continues to decline from 2021 to 2023. The results of mapping the importance of science learning on students' motivation in moral education still need to be studied and paid attention to by current researchers. Due to the rapid development of technology, currently, science learning increasingly requires a high level of thinking, so students must be given strong motivation to make their moral education better and more useful for everyday life, the environment, and the natural surroundings.

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