Indonesian Journal of Multidiciplinary Research

Journal homepage: http://ejournal.upi.edu/index.php/ IJOMR/

A Bibliometric Analysis of Global Trends in Science Education Research (1842–2022)

Aay Susilawati

Universitas Pendidikan Indonesia
*Correspondence: E-mail: aaysusilawati@upi.edu

ABSTRACT

The integration of science and education is central to fostering innovation, critical thinking, and sustainable development. This study aims to examine the historical and contemporary trends in academic publications related to science education by conducting a bibliometric analysis using the Scopus database. The search was performed with the query "science AND education" applied to titles, abstracts, and keywords, covering the period from 1842 to 2022. A total of 233,664 documents were retrieved and analyzed using Scopus analytics tools. Results reveal a steady increase in publication volume from the 1970s, with a marked surge beginning in 2000 and peaking in 2021. This growth reflects rising global interest in science education, driven by technological advancements, curriculum reform, and the COVID-19 pandemic's impact on teaching and learning. The findings highlight the evolving academic landscape and provide a foundation for future research and policy development in science education.

ARTICLE INFO

Article History:
Submitted/Received 17 May 2023
First Revised 18 Jun 2023
Accepted 27 Aug 2023
First Available online 28 Aug 2023
Publication Date 01 Sep 2023

Keyword:
Bibliometric analysis,
Education,
Publication trends,
Science,
Scopus.

1. INTRODUCTION

The intersection of science and education has long been recognized as a critical domain for societal progress, technological innovation, and sustainable development. As global challenges such as climate change, pandemics, and technological disruption intensify, the demand for scientifically literate citizens and educators capable of fostering scientific thinking has never been greater. Science education plays a pivotal role not only in shaping individual competencies but also in driving national competitiveness and global collaboration. In response, researchers have increasingly turned their attention to exploring, evaluating, and enhancing science education across diverse contexts. That is why many reports regarding science education have been well-documented (see **Table 1**).

Table 1. Previous studies regarding science education.

No	Title	Reference
1	Student development: Implementation of water rocket media as a project-based learning tool to improve the literacy of junior high school students during the pandemic	(Putra & Sakti, 2022)
2	Factors that affect the performance of selected high school students from the third district of Albay in International Mathematics Competitions	Jose (2022)
3	Undergraduate students' awareness to adopt gamification for learning in University of Ilorin, Nigeria	Ekunola *et al*., (2022)
4	Analysis of teacher skills in e-learning content development during distance learning during the covid-19 pandemic	(Nafsi & Maryanti, 2022)
5	Teaching and learning with technology: Effectiveness of ICT integration in schools	(Shah, 2022a)
6	Environmental education: A tertiary institution's indoor air quality assessment in Nigeria	(Abulude *et al*., 2022)
7	Methodology for investigating competency index of technical vocational education and training (TVET) instructors for 4.0 industrial revolution	(Shahroni *et al*., 2022)
8	Improving activities and learning outcomes of elementary school students through experimental methods using lime as an alternative electrical energy source during the covid-19 pandemic	(Octaviani *et al*., 2022)
9	Community extension: Literacy and numeracy enhancement program for alternative learning system and out-of-school youth learners	(Arciosa *et al*., 2022)
10	Efforts to increase the interest of junior high school students in mathematics lessons using the tik tok learning tool	(Dermawan *et al*., 2022)
11	Literature review: Technical and vocational education and training (TVET) in Malaysia	(Minghat *et al*., 2022)
12	Education on the importance of food consumed by breastfeeding mothers and exclusive breastfeeding against stunting prevention through power point media	(Ibrahim & Nandiyanto, 2022)
13	3D simulation of muscular system in anatomy learning	(Shabudin *et al*., 2022)
14	Development of an animation package in biology for teaching vertebrate, anatomy, and physiology	(Ala *et al*., 2022)
15	A study on attitude of urban and rural college students towards science	(Shah, 2022b)
16	Earthquake disaster preparedness for students of junior high school	(Widdyusuf *et al*. 2022)
17	Short play approach for analytical chemistry class	
18	Study the Relationship of Earthquake and Ionosphere Using IRI TEC for Education	(Phansori *et al*. 2021)

DOI: http://dx.doi.org/10.17509/xxxx.xxx
p- ISSN 2776-608X e- ISSN 2776-5970

Table 1 (Continue). Previous studies regarding science education.

No	Title	Reference
19	Detail experimental procedure for the construction process of robotic devices to teach aspect of auto mechanic	(Babalola & Omolafe, 2022)
20	Rice Tariffication Law: Education and Views of Farmers in the Southern Philippines	(Nueva *et al*., 2022)
21	The Integration of the Engineering Design Process in Biology-related STEM Activity: A Review of Thai Secondary Education	(Tipmontiane & William, 2022)
22	Constructive alignment approach for capstone project with industry involvement: Case study in Malaysia University	(Nugroho, 2021)
23	Teaching programming to chemical engineering students	(Andika & Putra, 2022)
24	Application of scrabble game in improving learning of simple sentence structure on the student with hearing impairment	(Rusyani *et al*., 2022)
25	permissive parenting style and maladaptive behavioral tendencies among junior high school students of Notre Dame of Tacurong College, Mindanao, Philippines	(Cabanatuan & Ahmad, 2022)

In general, over the past few decades, there has been a significant rise in academic publications dedicated to science education. This growth reflects a broader paradigm shift toward evidence-based pedagogy, integration of digital technologies, and curriculum reforms aligned with 21st-century skills. Bibliometric analysis provides an effective approach to quantitatively assess this scholarly activity, offering insight into publication trends, thematic evolution, and academic interest over time. Despite the growing importance of science education, few studies have systematically mapped the historical and contemporary trajectory of its academic discourse (see **Table 1**). The table presents a curated list of 14 scholarly articles published in 2022. Each entry includes the article title and its corresponding APA-style citation for ease of reference and academic use. The topics covered in these publications demonstrate a rich diversity of themes within the field of science education and educational technology. Several key trends emerge from this collection:

(i) Pandemic-Era Educational Innovations: Multiple studies focus on educational responses during the COVID-19 pandemic, such as the use of water rocket media for project-based learning (Putra & Sakti, 2022), e-learning content development (Nafsi & Maryanti, 2022), and experimental methods using lime for electricity generation in science learning (Octaviani *et al*., 2022). These reflect efforts to sustain student engagement and improve scientific literacy during remote learning.

(ii) Technology Integration in Teaching: Articles such as those by Jadhav *et al*. (2022), Shah (2022), and Ala *et al*. (2022) explore the integration of ICT and digital tools, including 3D simulations and animation packages in science classrooms, showcasing the growing interest in digital pedagogy.

(iii) Learning Motivation and Engagement: Gamification (Ekunola *et al*., 2022) and the use of platforms like TikTok (Dermawan *et al*., 2022) highlight strategies aimed at increasing student motivation, particularly in mathematics and university settings.

(iv) STEM and Competency Development: The emphasis on technical and vocational education and training (TVET) is visible in the works of Shahroni *et al*. (2022) and Minghat *et al*. (2022), aligning with global efforts to prepare students for Industry 4.0.

(v) Community Outreach and Health Education: Other contributions focus on community extension programs (Arciosa *et al*., 2022), stunting prevention through maternal education (Ibrahim & Nandiyanto, 2022), and environmental monitoring in higher

DOI: http://dx.doi.org/10.17509/xxxx.xxx
p- ISSN 2776-608X e- ISSN 2776-5970

education settings (Abulude *et al*., 2022), illustrating the intersection of education, health, and community service.

(vi) Student Performance in Competitive Contexts: Jose (2022) addresses academic performance in international mathematics competitions, shedding light on factors affecting student outcomes in high-pressure environments.

Collectively, these articles reflect the ASEAN region's dynamic educational landscape, emphasizing innovation, resilience, and relevance in science and technology education. The use of APA-style references facilitates scholarly citation and integration into broader academic work.

Here, to address current gap, the present study conducts a comprehensive bibliometric analysis of literature indexed in Scopus using the keywords "science AND education." Spanning from 1842 to 2022, this study seeks to uncover long-term patterns in publication output, identify periods of accelerated growth, and highlight potential drivers of scholarly interest.

The novelty of this study lies in its extensive temporal scope and its focus on the bibliometric dynamics of science education as a knowledge field. By tracing how publication trends have evolved, particularly in recent decades, the study contributes to a deeper understanding of how global events, technological advancements, and educational priorities have influenced the academic landscape. The findings are expected to inform future research directions, policy considerations, and strategic investments in science education at both national and international levels.

2. METHODS

This study employed a bibliometric analysis to examine the scholarly output related to science and education over time. The data were retrieved from the Scopus database, one of the largest and most comprehensive repositories of peer-reviewed academic literature. The search query was constructed using the keywords "science AND education," applied specifically to the title, abstract, and keyword fields (TITLE-ABS-KEY) to ensure that only documents explicitly addressing both terms were included in the analysis.

The search encompassed all available years in Scopus, ranging from 1842 to 2022. This wide temporal range allowed for identifying long-term publication trends and shifts in academic interest over nearly two centuries. The data extraction process yielded a total of 233,664 documents matching the search criteria. These records were then analyzed using the Scopus analytics tool, automatically aggregating and visualizing document counts by publication year.

The annual distribution of documents was reviewed to determine periods of notable increase or decline in publication activity. The resulting data were plotted in a line graph to display growth trends and identify significant turning points in the academic discourse surrounding science and education. In addition, recent years (2014–2022) were highlighted in a tabulated format to facilitate a more detailed inspection of current publishing patterns.

This method enabled a comprehensive overview of how research interest in science education has evolved, with particular attention to rapid growth phases, possible external influences (e.g., global educational reforms or pandemics), and thematic trends across time.

3. RESULTS AND DISCUSSION

Figure 1 illustrates the bibliometric trend of scholarly publications indexed in Scopus that include the terms "science AND education" within the title, abstract, or keywords from the

DOI: http://dx.doi.org/10.17509/xxxx.xxx
p- ISSN 2776-608X e- ISSN 2776-5970

year 1842 to 2022. Over this extensive period, a total of 233,664 documents were recorded, reflecting the evolving interest in the intersection of science and education. For more than a century, from the mid-1800s through the 1960s, the volume of publications remained relatively low and stable, indicating limited academic focus on the topic during that time.

However, beginning in the 1970s, there is a noticeable gradual increase, corresponding with the expansion of formal science education and the global prioritization of STEM (Science, Technology, Engineering, and Mathematics) fields. This upward trend becomes more pronounced after the year 2000, marking a significant acceleration in research output. Notably, the period from 2015 to 2022 reflects a steep rise in publications, with annual document counts climbing from 9,100 in 2015 to a peak of 15,927 in 2021. Although there is a slight decline in 2022 (15,888 documents), the overall trajectory remains upward.

This surge in interest may be attributed to several factors, including the digital transformation of education, the integration of innovative pedagogies, and the global response to the COVID-19 pandemic, which spurred a wave of research on remote science teaching and learning strategies. The data suggest a growing academic and institutional emphasis on the role of science education in shaping future competencies and addressing societal challenges.

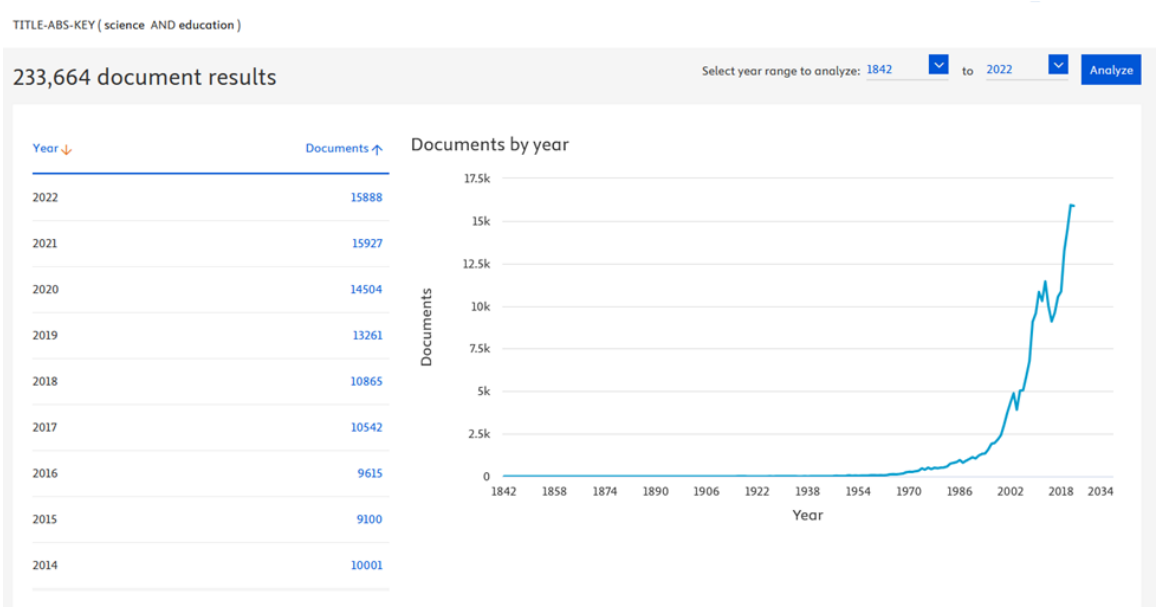

Figure 1. Bibliometric trend of publications indexed in Scopus with the keywords "science AND education" in the title, abstract, or keywords from 1842 to 2022. The chart displays a steady rise in publication volume from the 1970s, with a sharp increase in output beginning around 2000, peaking in 2021. The trend reflects growing scholarly interest in science education, particularly in response to global educational reforms and the COVID-19 pandemic.

4. CONCLUSION

This bibliometric study provides a comprehensive overview of the evolution of academic publications focusing on science and education over a span of 180 years. By analyzing data retrieved from the Scopus database using the query "science AND education," the study identified a total of 233,664 documents published between 1842 and 2022. The findings reveal a significant and sustained increase in research output, particularly from the early 2000s onward, with a notable peak in 2021. This upward trend reflects the growing global

DOI: http://dx.doi.org/10.17509/xxxx.xxx
p- ISSN 2776-608X e- ISSN 2776-5970

recognition of science education as a critical domain for addressing societal challenges, advancing innovation, and preparing future generations for a knowledge-based economy.

The rapid acceleration in publication volume may be attributed to various factors, including curriculum reforms, advancements in digital pedagogy, and increased academic interest during the COVID-19 pandemic. This analysis highlights the importance of sustained investment and research in science education and serves as a valuable foundation for guiding future scholarly inquiry and policy development.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

6. REFERENCES

Abulude, F.O., Acha, S., Gbotoso, O.A., Arifalo, K.M., Ademilua, S.O., Bello, L.J., Olayinka, Y.F., and Aladesaye, C. (2022). Environmental education: A tertiary institution's indoor air quality assessment in Nigeria. *ASEAN Journal for Science Education*, *1*(1), 41-48.

Ala, N.A., Onojah, A.O., Ishyaku, A.M., and Adamu, S.B. (2022). Development of an animation package in biology for teaching vertebrate, anatomy, and physiology. *ASEAN Journal for Science Education*, *1*(2), 117-130.

Andika, R., and Putra, Z. A. (2022). Teaching programming to chemical engineering students. *ASEAN Journal of Science and Engineering Education*, *2*(1), 51-60.

Arciosa, R.M., Perfecio, J., and Cerado, E.C. (2022). Community extension: Literacy and numeracy enhancement program for alternative learning system and out-of-school youth learners. *ASEAN Journal for Science Education*, *1*(2), 75-80.

Babalola, E. O., and Omolafe, E. V. (2022). Detail experimental procedure for the construction process of robotic devices to teach aspect of auto mechanic. *ASEAN Journal of Science and Engineering Education*, *2*(2), 169-176.

Cabanatuan, D., and Ahmad, C. (2022). Permissive parenting style and maladaptive behavioral tendencies among junior high school students of Notre dame of Tacurong College, Mindanao, Philippines. *ASEAN Journal of Science and Engineering Education*, *2*(1), 87-96.

Dermawan, R., Muktiarni, M., and Mupita, J. (2022). Efforts to increase the interest of junior high school students in mathematics lessons using the tik tok learning tool. *ASEAN Journal for Science Education*, *1*(2), 81-88.

Ekunola, G.T., Babalola, E.O., Omolafe, E.V., and Ibrahim, A.T. (2022). Undergraduate students' awareness to adopt gamification for learning in University of Ilorin, Nigeria. *ASEAN Journal for Science Education*, *1*(1), 17-22.

Ibrahim, M.M.M., and Nandiyanto, A.B.D. (2022). Education on the importance of food consumed by breastfeeding mothers and exclusive breastfeeding against stunting prevention through power point media. *ASEAN Journal for Science Education*, *1*(2), 103-112.

DOI: http://dx.doi.org/10.17509/xxxx.xxx
p- ISSN 2776-608X e- ISSN 2776-5970

Jose, M.T.N.S. (2022). Factors that affect the performance of selected high school students from the third district of Albay in International Mathematics Competitions. *ASEAN Journal for Science Education*, *1*(1), 9-16.

Minghat, A.D., Mustakim, S.S.B., and Shahroni, N. (2022). Literature review: Technical and vocational education and training (TVET) in Malaysia. *ASEAN Journal for Science Education*, *1*(2), 89-102.

Nafsi, N.R.R., and Maryanti, M. (2022). Analysis of teacher skills in e-learning content development during distance learning during the covid-19 pandemic. *ASEAN Journal for Science Education*, *1*(1), 23-32.

Nueva, J., Tanaleon, J. A., and Besa, A. (2022). Rice tariffication law: Education and views of farmers in the Southern Philippines. *ASEAN Journal of Science and Engineering Education*, *2*(2), 143-146.

Nugroho, H. (2021). Constructive Alignment approach for capstone project with industry involvement: Case study in Malaysia University. *Journal of Engineering Education Transformations*, 54-62.

Octaviani, H., Sakti, A.W., and Bilad, M.R. (2022). Improving activities and learning outcomes of elementary school students through experimental methods using lime as an alternative electrical energy source during the covid-19 pandemic. *ASEAN Journal for Science Education*, *1*(2), 63-74.

Phansori, N., Phukrongta, S., Kriamthaisong, O., and Kenpankho, P. (2021). Study the relationship of earthquake and ionosphere using IRI TEC for Education. *ASEAN Journal of Science and Engineering Education*, *2*(2), 153-156.

Putra, R.D., and Sakti, A.W. (2022). Student development: Implementation of water rocket media as a project-based learning tool to improve the literacy of junior high school students during the pandemic. *ASEAN Journal for Science Education*, *1*(1), 1-8.

Rusyani, E., Maryanti, R., Rahayu, S., Ragadhita, R., Al Husaeni, D. F., and Susetyo, B. (2022). Application of scrabble game in improving learning of simple sentence structure on the student with hearing impairment. *ASEAN Journal of Science and Engineering Education*, *2*(1), 75-86.

Shabudin, N.A.B., Wahab, N.B.A., Zamanhuri, M.A.B., and Rosli, A.H. (2022). 3D simulation of muscular system in anatomy learning. *ASEAN Journal for Science Education*, *1*(2), 113-116.

Shah, S.S. (2022a). Teaching and learning with technology: Effectiveness of ICT integration in schools. *Indonesian Journal of Educational Research and Technology*, *2*(2), 133-140.

Shah, S.S. (2022b). A Study on attitude of urban and rural college students towards science. *ASEAN Journal of Science and Engineering Education*, *2*(2), 177-182.

Shahroni, N., Minghat, A.D., and Mustakim, S.S.B. (2022). Methodology for investigating competency index of technical vocational education and training (TVET) instructors for 4.0 industrial revolution. *ASEAN Journal for Science Education*, *1*(1), 49-62.

DOI: http://dx.doi.org/10.17509/xxxx.xxx
p- ISSN 2776-608X e- ISSN 2776-5970

Tipmontiane, K., and Williams, P. J. (2022). The integration of the engineering design process in biology-related STEM activity: A review of Thai secondary education. *ASEAN Journal of Science and Engineering Education*, *2*(1), 1-10.

Wirzal, M. D. H., and Abd Halim, N. S. (2022). Short play approach for analytical chemistry class. *ASEAN Journal of Science and Engineering Education*, *2*(2), 163-168.

DOI: http://dx.doi.org/10.17509/xxxx.xxx
p- ISSN 2776-608X e- ISSN 2776-5970