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Research Trends and Knowledge Mapping in Science Education Based on Local Wisdom: A Bibliometric Analysis of Scopus 2016–2026

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Abstract

This study aims to analyze publication trends and map the knowledge structure of local wisdom-based science education research in Scopus-indexed literature from 2016 to May 2026. A bibliometric analysis was conducted using the PRISMA 2020 framework to identify and select relevant documents systematically. Data were retrieved from the Scopus database using keywords related to local wisdom, local knowledge, indigenous knowledge, traditional knowledge, science education, science learning, biology education, biology learning, and STEM education. After applying inclusion and exclusion criteria, 119 open-access English-language articles were analyzed using Biblioshiny through performance analysis and science mapping techniques. The findings reveal that research on local wisdom-based science education has increased, showing an annual growth rate of 15.79%. Indonesia emerged as the most productive contributing country, followed by the United States, South Africa, Australia, Canada, and New Zealand. Keyword and thematic analyses indicate that the intellectual structure of this field is centered on science education, local wisdom, indigenous knowledge, ethnoscience, STEM education, sustainability, and contextual learning. The thematic evolution demonstrates a shift from general discussions of local knowledge toward more specific research areas, including ethnoscience integration, teacher education, sustainability-oriented learning, and culturally responsive science education. This study provides a comprehensive knowledge map of local wisdom-based science education research and highlights future opportunities for developing collaborative and interdisciplinary studies that connect scientific knowledge with diverse cultural contexts.

Keywords:

Bibliometric analysis, Biblioshiny, Knowledge mapping, Local wisdom, Science education

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1. INTRODUCTION

Science education in the 21st century requires learning approaches that enable students to understand scientific concepts through meaningful connections with their social, cultural, and environmental contexts. Science learning that is separated from students' daily experiences may reduce opportunities for students to recognize the relevance of science in real-life situations. Therefore, contextual and culturally responsive approaches have become increasingly important because they position science as knowledge that develops within particular communities, environments, and cultural settings (Angela & Samantha, 2020; Gay, 2018; Lim et al., 2019).

One approach that has received growing attention in science education is the integration of local wisdom, local knowledge, indigenous knowledge, and traditional knowledge into learning processes. These knowledge systems represent accumulated experiences and practices developed by communities in interacting with their

environments. In science education, local knowledge can provide meaningful contexts for understanding scientific concepts related to ecology, biodiversity, natural resource management, health practices, agriculture, and environmental sustainability (Latip et al., 2024; Zidny et al., 2020). The integration of local wisdom therefore provides opportunities to bridge formal scientific knowledge with students' lived experiences and cultural identities.

Previous studies indicate that local wisdom-based science education contributes to various aspects of learning. Handayani et al. (2018) reported that integrating indigenous knowledge into science curricula can strengthen students' knowledge, attitudes, and skills by connecting learning materials with cultural and ecological contexts. Zidny & Eilks (2020) also demonstrated that the integration of indigenous knowledge and scientific perspectives can support sustainability-oriented chemistry education. Furthermore, studies on ethnoscience-based learning have shown potential in improving science literacy, critical thinking, creativity, and students' understanding of scientific concepts (Nurhasnah et al., 2022; Rahman et al., 2023). These findings demonstrate that local wisdom-based science education has developed as an important area within science education research.

Despite increasing attention to this field, existing studies have mainly focused on specific educational contexts, learning models, instructional materials, or particular scientific disciplines. Several studies have examined the implementation of ethnoscience-based learning, the development of local wisdom-based teaching materials, or the effects of culturally contextualized learning approaches on student outcomes (Febrian et al., 2024; Latip et al., 2024; Wati et al., 2023). Bibliometric studies have also been conducted, but many of them have examined narrower topics, such as ethnoscience in specific science disciplines or local wisdom in education more generally (Setianingrum et al., 2023). Consequently, a comprehensive understanding of how local wisdom-based science education has developed as a research field remains limited.

The research problem addressed in this study is the lack of an integrated knowledge map that explains publication trends, influential contributors, conceptual relationships, and thematic evolution in local wisdom-based science education research. Previous bibliometric studies have not sufficiently connected related concepts, including local wisdom, local knowledge, indigenous knowledge, traditional knowledge, science education, science learning, biology education, biology learning, and STEM education, within a single analytical framework. Without such mapping, it remains difficult to identify the intellectual structure of the field, emerging themes, and future research directions.

Bibliometric analysis provides an appropriate approach to address this problem because it enables researchers to examine the development of scientific fields through publication trends, citation patterns, collaboration networks, keyword relationships, and thematic structures (Donthu et al., 2021). By analyzing bibliographic metadata systematically, bibliometric studies can provide an overview of how knowledge is produced, connected, and developed within a research domain. Scopus was selected as the data source in this study because it provides structured bibliographic information, including publication records, authors, affiliations, keywords, citations, and references, which support comprehensive science mapping analysis.

The novelty of this study lies in its broader conceptual and analytical scope. Previous studies have mainly focused on specific learning approaches, particular scientific disciplines, or local wisdom within broader educational contexts (Arjaya et al., 2024; Setianingrum et al., 2023). In contrast, this study integrates multiple related concepts, including local wisdom, local knowledge, indigenous knowledge, traditional knowledge, science education, biology education, and STEM education, within a single bibliometric framework. This integrated approach provides a more comprehensive understanding of research development in local wisdom-based science education by identifying publication trends, influential contributors, intellectual structures, thematic relationships, and emerging research directions.

Therefore, this study aims to analyze research trends and map the knowledge structure of local wisdom-based science education in Scopus-indexed literature from 2016 to May 2026. Specifically, this study addresses the following research questions: (1) How have publication trends in local wisdom-based science education evolved in Scopus-indexed literature from 2016 to May 2026? (2) Which authors, countries, institutions, and publication sources have contributed significantly to this research field? (3) Which publications and references have influenced the development of local wisdom-based science education research? (4) What keyword networks and thematic structures characterize this research field? (5) How have research themes evolved over time, and what future directions can be identified?

2. LITERATURE REVIEW

2.1. Local Wisdom, Indigenous Knowledge, and Science Education

Local wisdom and indigenous knowledge have increasingly gained attention in science education because they provide meaningful contexts for connecting scientific concepts with students' cultural, social, and environmental experiences. Local wisdom refers to community-based knowledge, values, and practices

developed through interactions between people and their surrounding environments, while indigenous knowledge represents knowledge systems developed, maintained, and transmitted within communities through cultural processes and intergenerational experiences (Berkes, 2012; Senanayake, 2006). In science education, these knowledge systems provide alternative contexts for understanding scientific phenomena because scientific concepts can be related to real-life practices, including environmental management, biodiversity conservation, natural resource utilization, traditional food systems, and community practices related to natural phenomena.

The integration of local wisdom into science education supports contextual and culturally responsive learning by reducing the gap between formal scientific knowledge and students' everyday experiences. When science learning is presented without connections to students' cultural and environmental contexts, scientific concepts may become abstract and less meaningful. Previous studies indicate that incorporating local wisdom into science learning can enhance students' science literacy because learning materials become more relevant to their cultural backgrounds and surrounding environments (Verawati & Wahyudi, 2024). Similarly, Zidny et al. (2020) emphasized that indigenous knowledge can enrich science education by connecting scientific understanding with cultural perspectives and sustainability issues.

Furthermore, local wisdom-based science education has become increasingly associated with the development of 21st-century competencies, particularly when integrated with STEM approaches. Learning activities based on local contexts can encourage students to analyze problems, develop creative solutions, communicate ideas, and understand relationships among science, technology, culture, and society. Yolida et al. (2025) demonstrated that STEM learning based on local wisdom contributed to the improvement of students' creative thinking and communication skills. Therefore, local wisdom and indigenous knowledge can be positioned as important educational resources for developing science learning that is contextual, culturally responsive, and oriented toward contemporary educational goals.

2.2. Bibliometric Studies on Ethnoscience and Local Wisdom-Based Science Learning

Bibliometric studies indicate that ethnoscience and local wisdom-based science education have developed as interdisciplinary research fields connecting cultural knowledge, science education, contextual learning, and sustainability. Hidaayatullaah et al. (2021) identified research trends, collaboration patterns, and thematic developments in ethnoscience-based learning, while Jannah et al. (2023) showed that ethnoscience research has experienced significant growth with emerging themes related to science learning and cultural contexts. These findings indicate that ethnoscience is not only evolving as a cultural study but is also increasingly being positioned as a science education approach that can strengthen the connection between scientific concepts and students' local experiences.

Recent systematic and bibliometric reviews also indicate that ethnoscience-based science education has strong links to the curriculum, the learning environment, and instructional innovation. Hasibuan et al. (2023) emphasize that ethnoscience can be positioned as part of the implementation of the Merdeka Curriculum in science education because this approach supports the integration of local culture, independent learning, and the strengthening of critical thinking. Murwitaningsih & Maesaroh (2023) indicate that trends in ethnoscience research in Indonesia are largely focused on the development of learning and have implications for environmental education. Additionally, Sunarti et al., (2024) mapped trends in ethnoscience in physics learning and demonstrated that ethnoscience studies are increasingly developing within the field of physics education as part of bibliometric network mapping. Bibliometric research on local wisdom-based science learning still has room for development, particularly in mapping the relationships between local wisdom, indigenous knowledge, science education, biology education, STEM education, and sustainability education more broadly within the Scopus-indexed literature.

2.3 Research Gap and Conceptual Position of This Study

Bibliometric studies on ethnoscience and local wisdom in education have grown, but some earlier studies still differ in scope from the focus of this research. Ainaya et al., (2026) mapped the research productivity of ethnoscience based on Google Scholar for the period 1966–2023 using Publish or Perish and VOSviewer. The study indicates that ethnoscience research still holds significant potential for development, particularly in the integration of ethnoscience with sustainability, digital learning, global challenges, and underrepresented contexts. Arjaya et al., (2024) have also mapped trends in the integration of local wisdom into education through Scopus publications from 2020 to 2024 and found that Indonesia is the primary contributor, followed by the United States and Australia. The study confirms that local wisdom has a strong connection to cultural preservation, educational relevance, and sustainability, but research on it remains largely confined to the broader field of education.

Based on this gap, this study focuses more specifically on mapping local wisdom-based science education in Scopus-indexed literature from 2016 to 2026. The conceptual framework of this study differs from previous

bibliometric studies because it does not merely discuss ethnoscience in general or local wisdom in education broadly, but connects local wisdom, local knowledge, indigenous knowledge, traditional knowledge, science education, science learning, biology education, biology learning, and STEM education within a single analytical framework. This study aims to clarify the knowledge structure, contribution patterns, keyword networks, citation patterns, and the evolution of themes in local wisdom-based science education. This is important because bibliometric mapping not only serves to show the number of publications but also helps identify dominant themes, new topics, key contributors, and future research areas in the development of science education that is contextual, culturally responsive, and sustainability-oriented.

3. RESEARCH METHOD

This study employs a bibliometric analysis approach to map research trends, knowledge structures, and thematic developments in science education based on local wisdom. Bibliometric analysis was chosen because it allows researchers to systematically and quantitatively identify publication patterns, productive authors, influential sources, international collaborations, citation patterns, and keyword networks (Donthu et al., 2021).. Document identification and selection were conducted by adapting the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) framework. This framework was used to enhance the transparency of the document selection process through the identification, screening, eligibility, and inclusion stages (Page et al., 2021).

The data were obtained from the Scopus database because Scopus provides multidisciplinary, curated, and structured bibliographic metadata that are widely used in bibliometric studies. Data retrieval was conducted on May 9, 2026, using the advanced search feature in Scopus. The search strategy combined two keyword groups. The first group represented local and traditional knowledge, while the second group represented science-related education. The Scopus search string was formulated as follows: TITLE-ABS-KEY ("local wisdom" OR "local knowledge" OR "indigenous knowledge" OR "traditional knowledge") AND TITLE-ABS-KEY ("science education" OR "science learning" OR "biology education" OR "biology learning" OR "STEM education") AND PUBYEAR > 2015 AND PUBYEAR < 2027.

The publication period from 2016 to May 2026 was selected to capture research developments over eleven years. No document type, language, or open-access filters were applied in the initial Scopus search string. These criteria were applied during the screening stage based on Scopus metadata. The inclusion criteria consisted of original Scopus-indexed articles published between 2016 and May 2026, written in English, available as open-access documents, and relevant to local wisdom-based science education. The exclusion criteria included conference papers, book chapters, reviews, notes, books, conference reviews, short surveys, letters, errata, editorials, articles in press, non-English articles, and non-open-access articles. The open-access criterion was applied to ensure the accessibility of full-text documents during relevance verification and to support transparency in the document screening process.

Since this study is a bibliometric analysis, no human participants were involved. The research population consisted of Scopus-indexed publications related to local wisdom-based science education. Based on the initial search, 348 documents were identified from the Scopus database. During the identification stage, 151 documents were excluded because they did not meet the document type criterion, leaving 197 original articles. During the screening stage, 9 articles in press were excluded, resulting in 188 published articles. Four non-English articles, consisting of 3 Spanish-language articles and 1 Turkish-language article, were then excluded, leaving 184 English-language articles. The open-access criterion was subsequently applied, excluding 65 non-open-access articles. Finally, 119 open-access English-language articles were included in the bibliometric analysis. The document selection process based on the adapted PRISMA 2020 framework is presented in Figure 1.

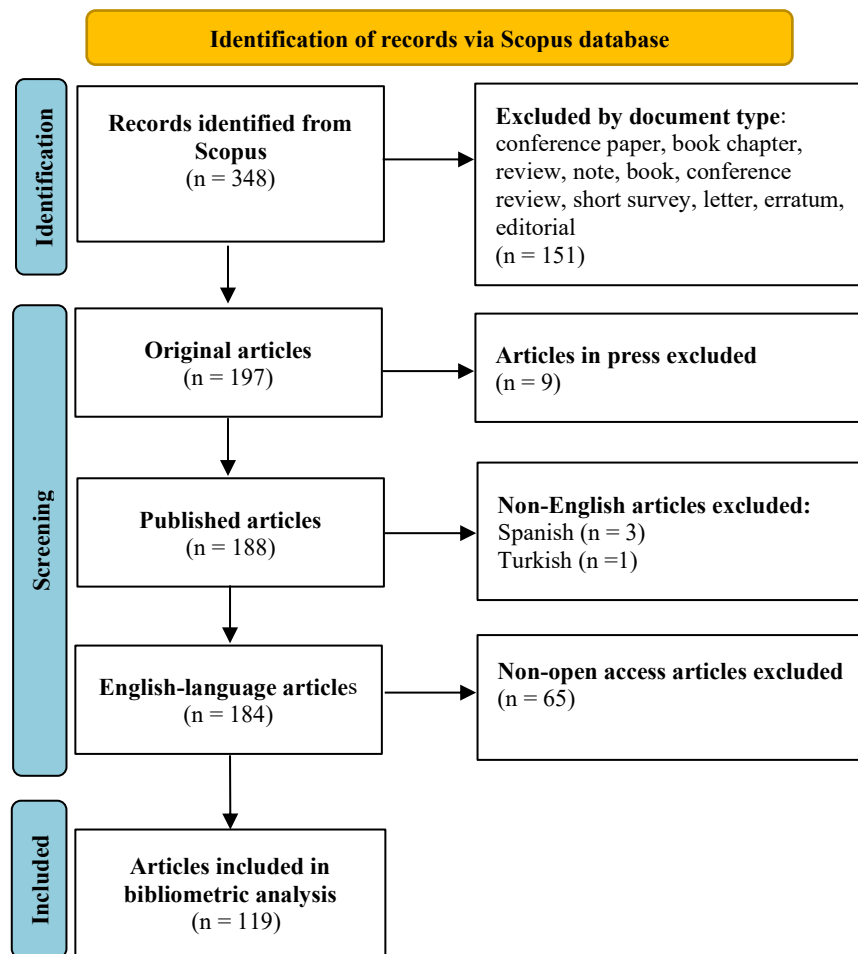


Figure 1. Prisma Flow Chart

Bibliographic data from the included articles were exported from Scopus in .csv format. The exported metadata included article title, author name, publication year, abstract, keywords, journal title, affiliation, country, number of citations, and references. The data were analyzed using Biblioshiny via RStudio. Biblioshiny is a web-based interface for the bibliometrix package designed to support comprehensive bibliometric analysis and science mapping (Aria & Cuccurullo, 2026). The analysis consisted of performance analysis and science mapping. Performance analysis was used to identify annual scientific output, the most relevant sources, the most productive authors, national scientific output, and the most cited documents. Science mapping was used to examine keyword co-occurrence, thematic maps, thematic evolution, and collaboration networks. Biblioshiny is used as the primary tool for processing, analyzing, and visualizing bibliometric data in this study.

4. RESULT AND DISCUSSION

4.1. General Description of Bibliometric Data

Table 1 shows that this study analyzed 119 open-access articles indexed in Scopus during the period 2016–2026. These articles were published in 84 journals, involved 438 authors, and contained 6,715 references. An annual growth rate of 15.79% indicates that the topic of local wisdom-based science education has experienced positive growth over the past decade. The average document age of 3.01 years also indicates that most articles in the dataset are relatively recent publications, meaning the resulting knowledge map can illustrate the direction of current research.

The total of 393 author's keywords and 150 Keywords Plus terms indicates that this field exhibits a fairly wide range of conceptual variations. This variation is evident through the use of terms such as local wisdom, indigenous knowledge, local knowledge, traditional knowledge, ethnoscience, science education, and STEM education. This situation reinforces the rationale for using bibliometric analysis, as this method can systematically map patterns of productivity, citation structures, collaboration networks, and conceptual relationships within a specific research field (Donthu et al., 2021). The process of data cleaning and harmonization is also crucial to ensure that variations in terms with similar meanings do not fragment conceptual

clusters, as emphasized by [Lim et al., \(2024\)](#) in their guidelines for the merging and cleaning of bibliometric data.

In terms of collaboration, this dataset shows 3.9 co-authors per document and 26.05% international co-authorship. These figures indicate that science education research based on local wisdom is not only developing as individual studies but also as a collaborative agenda across institutions and countries. These findings are relevant to the nature of the field of local and indigenous knowledge, which fundamentally requires dialogue between academic knowledge, community practices, cultural contexts, and sustainability issues ([Druker-Ibanez & Caceres-Jensen, 2022](#); [Latip et al., 2024](#)).

Table 1. Main Information About Data

Description	Results
Main Information About Data	
Timespan	2016:2026
Sources (Journals, Books, etc)	84
Documents	119
Annual Growth Rate %	15.79
Document Average Age	3.01
Average citations per doc	14.67
References	6715
Document Contents	
Keywords Plus (ID)	150
Author's Keywords (DE)	393
Authors	
Authors	438
Authors of single-authored docs	15
Authors Collaboration	
Single-authored docs	16
Co-Authors per Doc	3.9
International co-authorships %	26.05
Document Types	
article	119

4.2. Publication Trends of Local Wisdom-Based Science Education Research

Figure 2 shows that publications on local wisdom-based science education in Scopus-indexed literature experienced fluctuating but generally increasing growth during the 2016–May 2026 period. In the early period, the number of publications was relatively low, with 3 articles in 2016, increasing to 6 articles in 2017, and then decreasing to 3 articles in both 2018 and 2019. The number of publications increased to 9 articles in 2020 and remained at 9 articles in 2021, before slightly declining to 7 articles in 2022. Publications then increased again to 9 articles in 2023, followed by a sharper rise to 18 articles in 2024, and reached the highest point with 39 articles in 2025. In 2026, 13 articles were recorded however, this number should be interpreted cautiously because the data for 2026 were retrieved on May 9, 2026, and therefore represent only partial-year data rather than the total annual publication output.

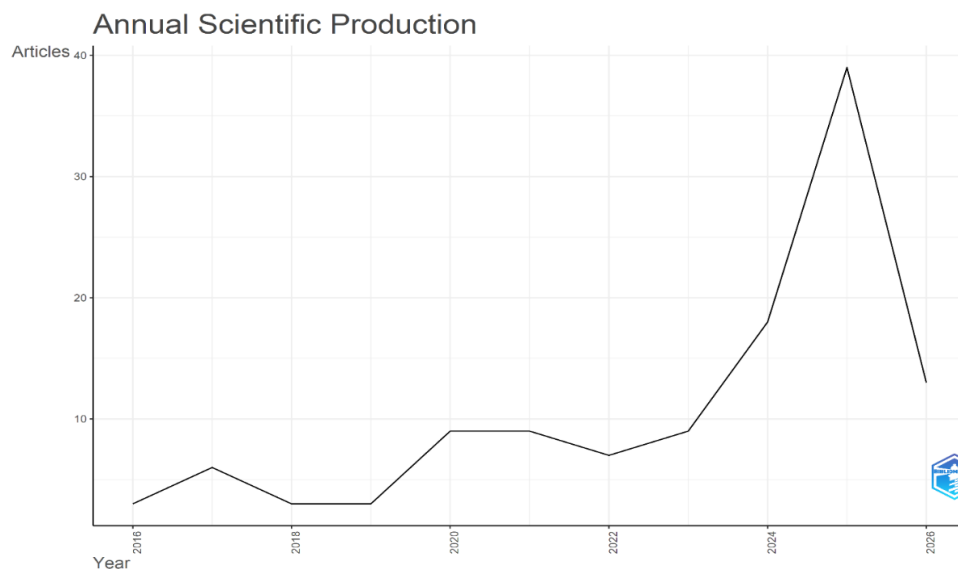


Figure 2. Annual Scientific Production

The increase in publications after 2020 indicates that local wisdom, ethnoscience, and community knowledge are increasingly being positioned as an important part of contextual science learning innovation. [Rahmawan & Rahayu, \(2023\)](#) assert that ethnoscience-based science literacy modules in chemistry education still need further development as they have not yet been optimally utilized, while [Ardianti & Raida, \(2022\)](#) demonstrate that the implementation of ethnoscience-based project-based learning can support elementary school students' understanding of scientific concepts. The surge in publications in 2024 and 2025 also indicates that local wisdom-based science education is becoming increasingly relevant in addressing current science learning needs. [Verawati & Wahyudi \(2024\)](#) demonstrate that integrating local wisdom can enhance science literacy because learning becomes more closely aligned with students' cultural contexts. In line with this, [Rahman et al., \(2023\)](#) demonstrated through a meta-analysis that project-based learning grounded in ethnoscience influences students' critical thinking skills. Thus, the trend of increasing publications not only indicates quantitative growth but also reflects an expansion in research focus from the introduction of local wisdom toward the development of learning models, science literacy, 21st-century skills, and culturally responsive science education.

Figure 3 shows that the average citations per year for publications on local wisdom-based science education followed a fluctuating pattern during the 2016–2026 period. Publications from 2016 had the highest average citations, followed by a decline in subsequent years. The average citations increased significantly again in 2020, but then tended to decline through 2026. This pattern suggests that articles published in the early years have a greater chance of receiving citations because they have been available longer within the scientific ecosystem. Therefore, a high average citation count for older publications does not necessarily indicate that these publications are of higher quality than newer ones; rather, it is also influenced by the document's age, the time taken to accumulate citations, and the article's visibility within the academic community. [Tahamtan & Bornmann, \(2019\)](#) emphasize that citation counts are influenced by various factors, not only scientific quality but also the citation context, article characteristics, field of study, and authors' citation behavior. [Waltman, \(2016\)](#) also explains that citation indicators need to be interpreted carefully because comparisons of citation impact can be influenced by differences in field, database, and publication period.

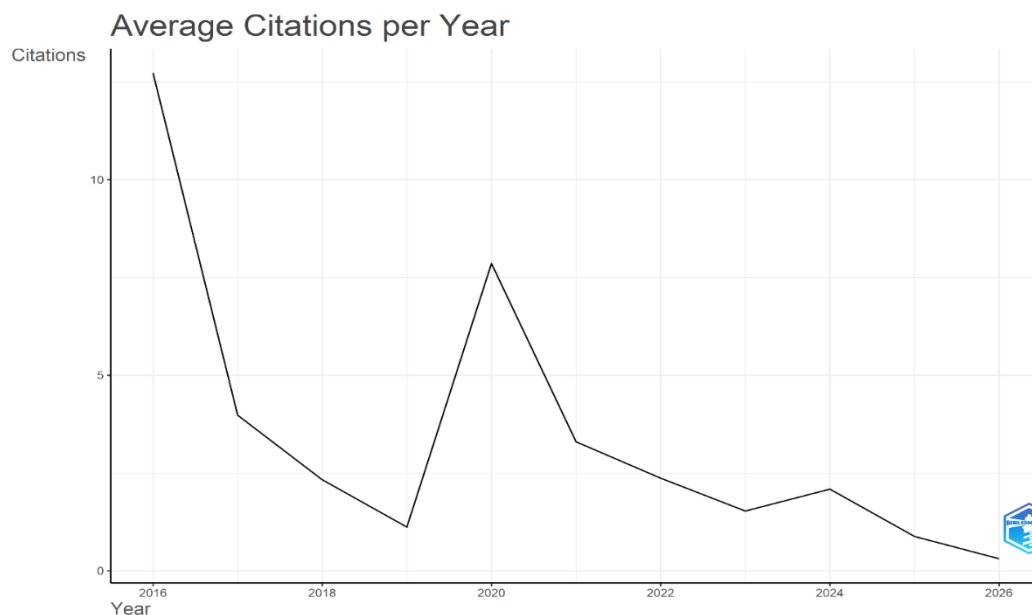


Figure 3. Average Citation per Year

The decline in average citations after 2020 should not be immediately interpreted as a decline in the academic influence of the field of local wisdom-based science education. This decline is more likely related to the limited citation history of new articles, particularly publications from 2024–2026, which have not yet had sufficient time to be widely cited. In bibliometric studies, citation analysis is indeed useful for assessing the intellectual influence of a publication or field, but this indicator must be interpreted in conjunction with publication trends, thematic maps, and the context of scientific development. Zupic & Čater (2015) explain that bibliometric analysis, including citation analysis, can help map the intellectual structure of a field, but the selection of indicators must be tailored to the research questions. Hicks et al., (2015) also emphasize that quantitative indicators should be used to support academic evaluation, not as the sole basis for evaluation. Thus, this figure shows that early publications in the field of science education based on local wisdom have a higher citation impact, while recent publications are still in the citation accumulation phase.

4.3. Leading Contributors in Local Wisdom-Based Science Education Research

Figure 4 shows that the Jurnal Pendidikan IPA Indonesia is the most relevant publication source in studies on local wisdom-based science education, with 9 articles. The next positions are held by Education Sciences and the International Journal of Evaluation and Research in Education, each with 5 articles. Furthermore, the Journal of Baltic Science Education, Perspectives in Education, and Revista de Gestão Social e Ambiental each contain 3 documents, while the Australian Journal of Indigenous Education, Cultural Studies of Science Education, Discover Education, and the International Journal of Information and Education each contain 2 documents. This pattern indicates that publications on local wisdom-based science education are distributed across journals in science education, general education, educational evaluation, indigenous education, culture, and the environment. Thus, this field is not confined to a single journal cluster but is spread across disciplines, as it connects issues of science learning, culture, local wisdom, indigenous education, and sustainability.

The dominance of certain publication sources can be interpreted as an indication of the emergence of core journals or *core sources* in a particular field. Çiftçi et al., (2016) explain that analyzing the distribution of articles across journals is important for identifying publication concentrations and pinpointing the journals that play a significant role in the development of a particular field of education. Their findings indicate that the majority of articles in the field of education are concentrated in a small number of high-impact journals, although the remainder are still distributed across many other journals. The pattern in this figure shows a similar trend: the Indonesian Journal of Science Education holds the most dominant position, but other articles remain distributed across international journals with more diverse focuses. The presence of Education Sciences and several other international journals also indicates that this topic has global reach and is not limited solely to the Indonesian context. In science education bibliometrics, publication sources often serve as key indicators for examining knowledge dissemination channels, academic networks, and a topic's position within the scientific ecosystem. Kadirhanoğulları & Köse, (2023) demonstrate that source analysis in science education bibliometric studies can identify journals that publish the most documents, are most frequently cited, and hold significant positions within publication networks. In this context, the presence of journals such as Education Sciences, Cultural Studies of Science Education, and the Australian Journal of Indigenous Education indicates that studies on local

wisdom in science education are linked to cross-cultural education, local knowledge systems, and the development of learning that is responsive to socio-cultural contexts.

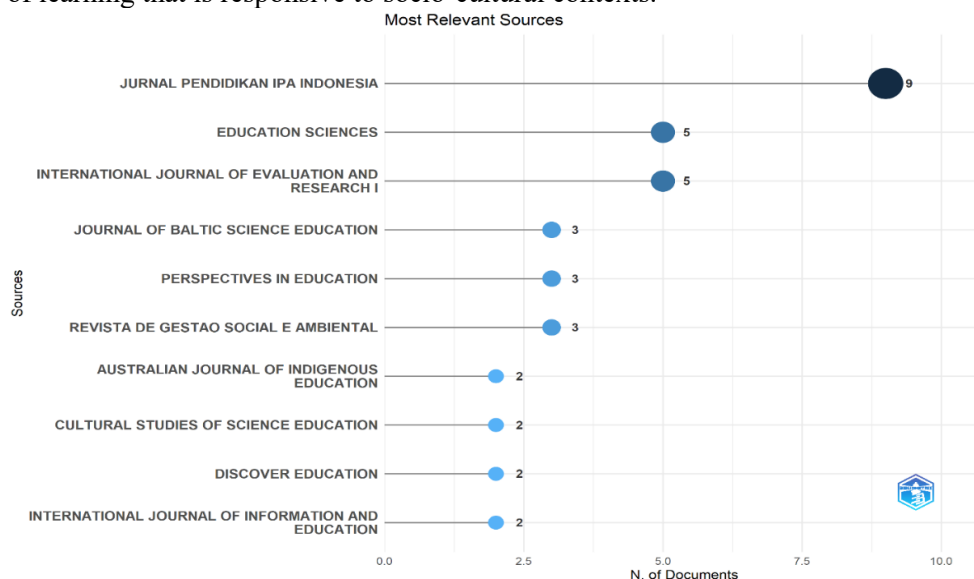


Figure 4. Most Relevant Sources

Figure 5 shows that Gumbo MT and Suyanto S are the most productive authors with 3 documents each, while Cowie B, Diliarosta S, Hipkins R, James A, Kurniawan W, Lestari N, Margunayasa IG, and Mirza UJ each have 2 documents. This distribution indicates that author productivity in this field remains relatively dispersed. No single author or pair of authors has yet emerged as a dominant force. This situation indicates that the field of local wisdom-based science education is open and multidisciplinary, as contributions come from a diverse range of researchers with different local focuses, pedagogical themes, and methodological approaches.



Figure 5. Most Relevant Authors

Co-authorship analysis is particularly important in bibliometric studies because it can identify the academic actors contributing to the development of a research field. Hassan & Duarte, (2024) explain that co-authorship analysis can provide insights into the dynamics of collaboration among authors, institutions, and countries. In line with this, Sari & Aypay (2024) used co-authorship analysis to identify collaboration patterns in the field of education policy. The productivity of Gumbo MT and Suyanto S, who each produced three documents, indicates that authors' contributions in the field of local wisdom-based science education remain relatively dispersed and have not yet concentrated around a single dominant figure. This pattern indicates that the field is still in a growth phase and has the potential to be strengthened through collaboration across authors, institutions, and countries.

Figure 6 shows that Padang State University was the most productive affiliate with 8 articles, followed by Semarang State University with 5 articles. Malang State University, Surabaya State University, the University of Idaho, and Yogyakarta State University each produced 4 articles. This pattern indicates that teacher education institutions in Indonesia serve as key nodes in the production of knowledge regarding *local wisdom-based*

science education. The dominance of teacher education institutions can be understood because the integration of local wisdom into science learning requires pedagogical readiness, the ability to develop instructional materials, and the capacity of prospective teachers and teachers to connect scientific concepts with community cultural practices. Suciati, (2023) indicates that science teacher candidates still face challenges in integrating local wisdom, particularly in lesson planning, assessment, and instructional implementation; thus, higher education institutions have a significant opportunity to develop science curricula based on local wisdom. Verawati et al., (2022) also demonstrate that integrated *inquiry-creative* learning grounded in ethoscience is effective in enhancing the critical thinking skills of science teacher candidates, thereby strengthening the role of higher education institutions in preparing educators capable of managing culture-based science instruction. Furthermore, Yazidi & Rijal, (2024) emphasize that the integration of *indigenous knowledge* into science education requires support for teacher professional development as well as collaboration between educational institutions and local communities to ensure that learning becomes more relevant, inclusive, and sustainability-oriented.

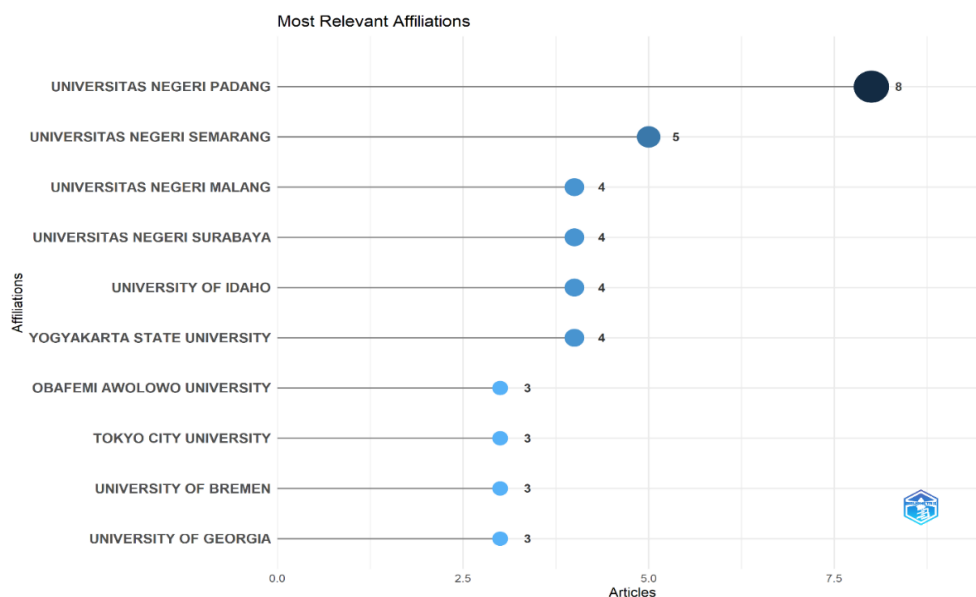


Figure 6. Most Relevant Affiliations

Table 2 and Figure 7 show that Indonesia is the most productive country with a frequency of 111, followed by the United States with 60, South Africa with 19, Australia with 15, Canada with 13, and New Zealand with 12. These countries have strong research traditions regarding indigenous knowledge, education for indigenous communities, and the development of culturally responsive science education. Latip et al., (2024) also report that the topic of local and indigenous knowledge in science education is widely studied in Indonesia, the United States, Canada, Australia, and African countries. This common pattern reinforces the validity of the finding that this field is developing through two major pathways: the context of Indonesian local wisdom and the context of global indigenous education.

Table 2. Top 10 Countries Contributing

Region	Frequency
Indonesia	111
United States	60
South Africa	19
Australia	15
Canada	13
New Zealand	12
Chile	9
England	9
Japan	8
Nigeria	6

Country Scientific Production

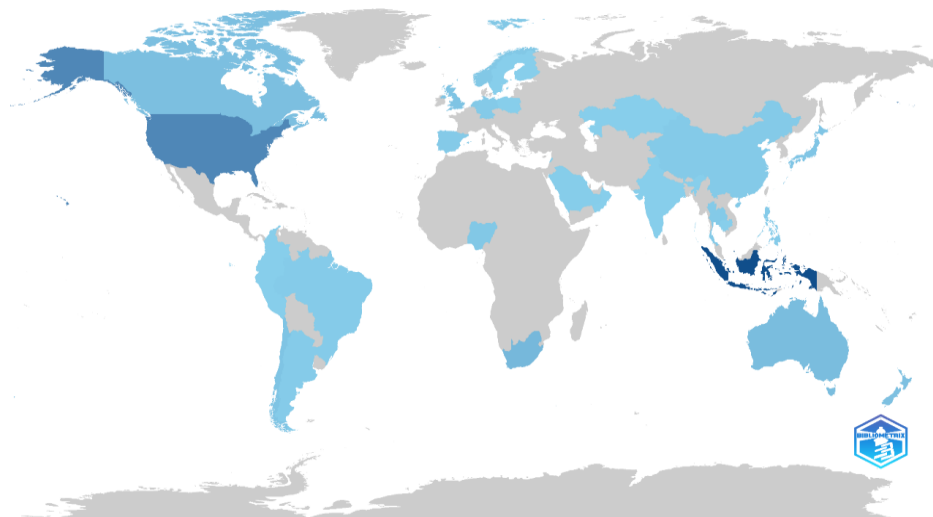


Figure 7. Country Scientific Production

The international collaboration rate of 26.05% in Table 1 indicates that this field has established cross-national networks, although there is still room for strengthening collaboration. International collaboration is necessary because issues related to local wisdom, indigenous knowledge, and sustainability education cannot be fully understood within a single national context. [Druker-Ibanez & Caceres-Jensen \(2022\)](#) emphasize that integrating local knowledge into sustainable education requires recognition of epistemic plurality and socio-cultural contexts. Therefore, cross-national collaboration can enrich methodological perspectives while preventing the oversimplification of the concept of local wisdom as merely a local example in teaching materials.

4.4. Influential Documents and Citation Patterns

The citation analysis in Figures 8 and 9 shows that influential documents in the field of local wisdom-based science education originate not only from science education studies, but also from ecology, conservation, indigenous peoples' education, and sustainability. The high global citation count for [Kobori et al. \(2016\)](#) indicates that issues of ecology, conservation, and community engagement have a strong influence on the development of local wisdom-based research. [Kobori et al., \(2016\)](#) emphasize that citizen science plays a role in connecting ecology, education, conservation, and human social systems. Furthermore, the high ranking of [Zidny et al. \(2020\)](#), [Brown \(2017\)](#), and [Cajete \(2020\)](#) demonstrates that the conceptual foundation of this field is closely tied to the integration of indigenous knowledge, culturally responsive science education, and sustainability. [Zidny et al., \(2020\)](#) explain that indigenous knowledge can enrich science education for sustainability, while [Brown \(2017\)](#) highlights the connection between culturally responsive approaches and inquiry-based science education practices. [Cajete \(2020\)](#) also positions Indigenous science as a crucial framework for addressing climate change and building the resilience of indigenous communities.

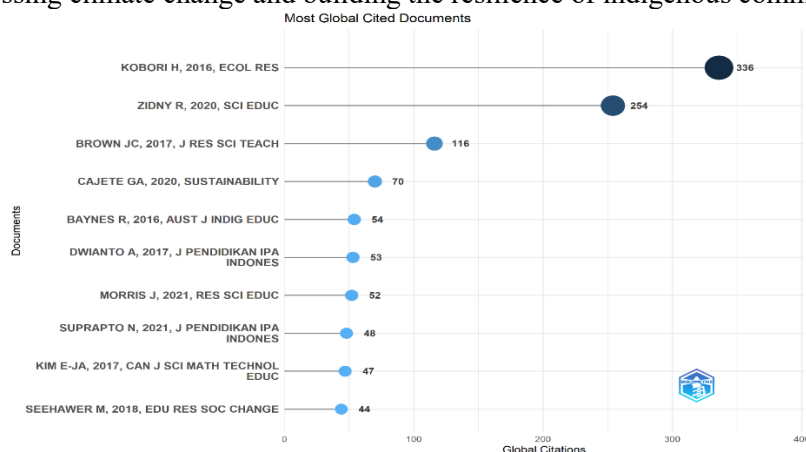


Figure 8. Most Global Cited Document

The most frequently cited local references reinforce the fact that this study is grounded in theories of cross-cultural science education, the epistemology of indigenous communities, and the plurality of knowledge. The works of [Zidny et al. \(2020\)](#), [Bang et al. \(2010\)](#), [Aikenhead \(1996\)](#), and [Ogawa \(1995\)](#) indicate that science education research grounded in local wisdom still requires a conceptual foundation from studies on the relationship between school science, students' cultures, and community knowledge systems. [Bang & Medin \(2010\)](#) emphasize the importance of supporting students in navigating various epistemologies in science education, while [Aikenhead \(1996\)](#) explains that science learning involves a process of border crossing between students' lived worlds and the subculture of school science. [Ogawa \(1995\)](#) also offers a multisience perspective, namely the view that science needs to be understood in a more pluralistic way and not solely centered on the Western scientific tradition.

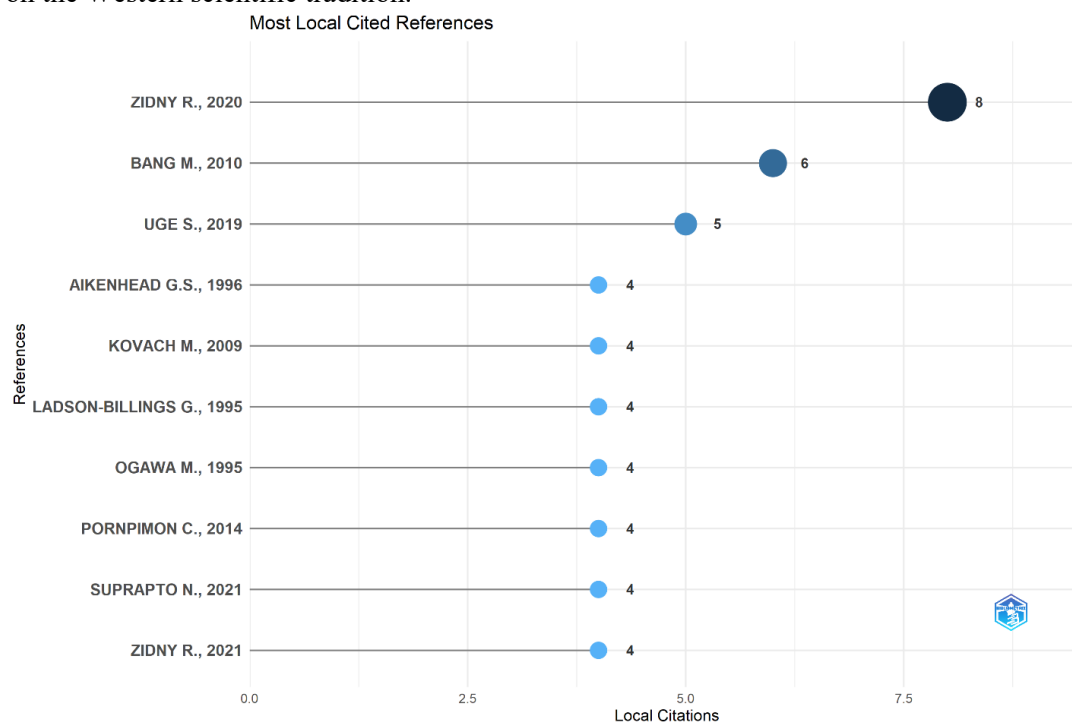


Figure 9. Most Local Cited References

Figure 10, a co-citation network, shows that the field of local wisdom-based science education has an intellectual structure divided into several clusters, meaning that its knowledge base does not stem from a single scientific tradition but rather from the intersection of science education, cultural studies, indigenous knowledge, contextual learning, and sustainability. In bibliometric analysis, co-citation is used to examine relationships among frequently co-cited references, thereby identifying the proximity of theories, methods, or topics within a research field. [Chen et al., \(2023\)](#) explain that science mapping can reveal intellectual interactions and structural relationships among research elements, while [Killi et al., \(2024\)](#) emphasize that co-citation analysis is used to determine relationships among research elements and understand the intellectual structure of a field. The clusters in this figure indicate that science education research based on local wisdom remains interdisciplinary and has the potential to be strengthened through the more systematic integration of science education theory, indigenous knowledge, culturally responsive pedagogy, and sustainability education.

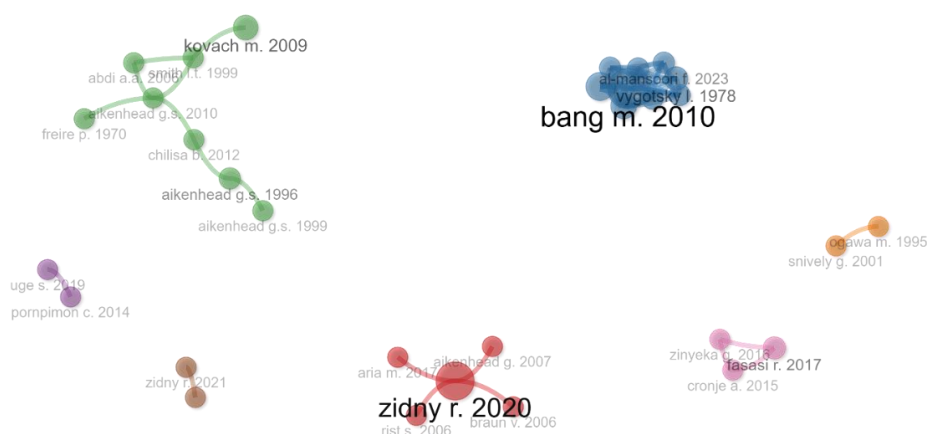


Figure 10. Co-citation Network

4.5. Keyword Co-occurrence and Thematic Structure

The data in Table 3 show that the most dominant keyword is science education with 27 occurrences, followed by local wisdom with 22 occurrences and indigenous knowledge with 15 occurrences. This pattern indicates that the research field analyzed centers on three main areas: science education, local wisdom, and indigenous knowledge. The dominance of “science education” indicates that studies of local wisdom are not merely discussed as cultural issues but are situated within the context of science education learning and development. Meanwhile, the high frequency of “local wisdom” and “indigenous knowledge” underscores that this research frequently highlights the role of local knowledge as a learning resource, a learning context, and a bridge between scientific concepts and students’ socio-cultural experiences.

Table 3. Most Relevant Words

Keyword	Number of Occurrences
Science Education	27
Local Wisdom	22
Indigenous Knowledge	15
Education	10
Ethnoscience	9
Science Learning	8
Sustainability	8
Indigenous Knowledge Systems	7
Stem	7
Biology	5

The emergence of the keywords ethnoscience, science learning, sustainability, STEM, and biology indicates that science education research based on local wisdom has expanded in scope. Ethnoscience serves as a conceptual approach that connects cultural practices with scientific knowledge, as local traditions can be mapped onto scientific concepts such as biology, physics, and chemistry (Hunaepi et al., 2024). Sustainability indicates that local wisdom is often associated with environmental issues, conservation, and sustainable education, as demonstrated by Sihombing et al., (2025), who found that the integration of ethnoscience into science education can support environmental awareness, cultural preservation, and sustainable behavior. The keyword STEM indicates that local wisdom is beginning to be integrated with 21st-century learning approaches; Julianti et al., (2025) demonstrate that an ethnoscience-oriented PjBL-STEM model in biology education can strengthen science literacy, learning motivation, as well as critical thinking, creativity, communication, and collaboration skills. The keyword biology highlights the contribution of biology education in this study, particularly regarding biodiversity, local ecology, traditional food, and culturally contextualized learning; Fauzi et al., (2024) emphasize that biology education research grounded in local wisdom is crucial for enriching the curriculum and preserving cultural heritage. Table 3 reinforces the research position that local wisdom-based science education is an interdisciplinary field because it connects science education, culture, indigenous knowledge, sustainability, STEM, and biology.

Figure 11 shows a co-occurrence network that forms several clusters. The first cluster centers on science education, local wisdom, and indigenous knowledge. This cluster represents the core structure of the research field. The second cluster relates to education, students, and project-based learning, indicating that research on local wisdom is beginning to focus on instructional design and student engagement. The third cluster relates to

ethnoscience, STEM, and critical thinking, thus demonstrating the integration of local wisdom with 21st-century skills. The fourth cluster connects sustainability, traditional knowledge, and indigenous populations, indicating a strong link between culture-based science education and the sustainability agenda.

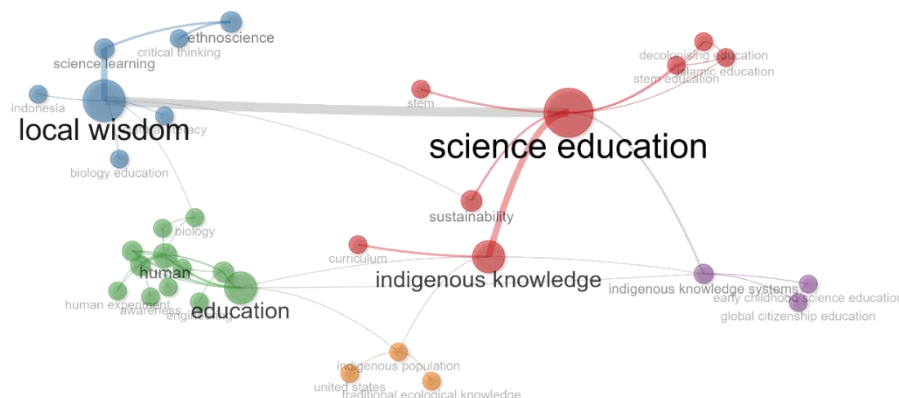


Figure 11. Co-occurrence Network

This cluster structure indicates that this field is not singular. Research on local wisdom-based science education operates at the intersection of pedagogy, culture, ecology, and curriculum transformation. [Febrian et al., \(2024\)](#) state that the integration of local wisdom and indigenous knowledge into science learning can be achieved through curriculum revitalization, the development of learning materials, and further scientific research. [Verawati & Wahyudim \(2024\)](#) also demonstrate that incorporating local wisdom into science education can support improvements in students' science literacy because the material becomes more closely aligned with their cultural and environmental experiences.

Figure 12 shows a thematic map based on centrality and density. The themes of education, students, and project-based learning are located in the motor themes quadrant, which means these themes have developed well and have strong connections with other themes. In thematic map analysis, motor themes are understood as themes with high centrality and density, thus playing a crucial role in shaping the structure of the field of research ([Alkhamash, 2023](#)). The themes of sustainability, indigenous populations, and traditional knowledge are also located in the motor themes area, and can thus be understood as mature and important themes for the development of science education studies based on local wisdom. This position aligns with [Yazidi & Rijal \(2024\)](#), which indicates that the integration of indigenous knowledge into science education can support learning oriented toward sustainable development. [Dei et al.,\(2025\)](#) also emphasize that indigenous knowledge possesses local, intergenerational, holistic, and relevant characteristics for understanding the relationship between communities and the environment. The positioning of the themes of sustainability, indigenous populations, and traditional knowledge as driving themes indicates that this research is not only advancing in pedagogical aspects but also addressing issues of sustainability, indigenous knowledge, and recognition of the diversity of knowledge systems.

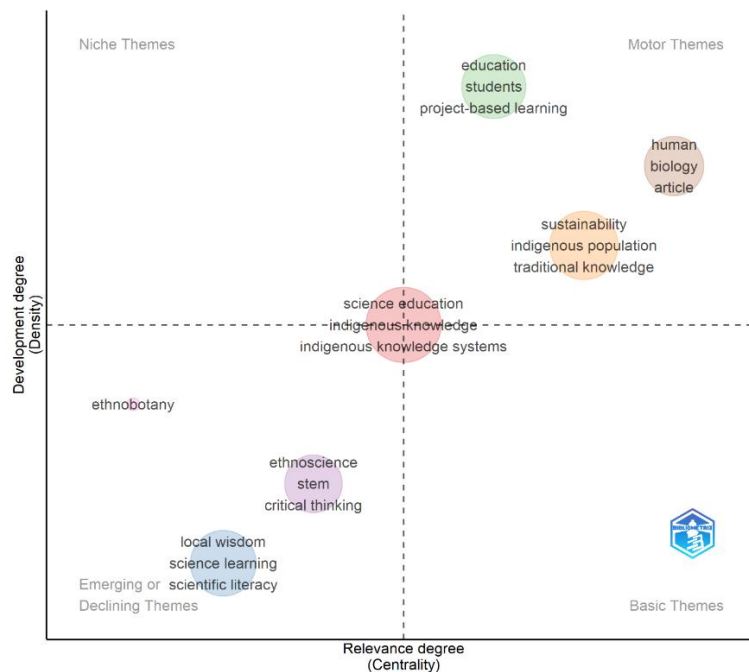


Figure 12. Thematic Map

The themes of science education, indigenous knowledge, and indigenous knowledge systems are located near the center of the thematic map. This position indicates that these three themes serve as conceptual links between foundational themes and more specific themes. The themes of local wisdom, science learning, and scientific literacy are situated in the quadrant of emerging or declining themes. This positioning requires careful interpretation. This does not mean these themes are unimportant, but rather indicates that their terminology and research orientations are still evolving, shifting, or lack the same density of connections as other themes. The study by [Setianingrum et al., \(2023\)](#) also suggests that research on local wisdom in science education requires further exploration, particularly to strengthen appreciation for local culture.

The themes of ethnoscience, STEM, and critical thinking also emerge as themes that are not yet fully established. This finding is important because all three represent potential directions for development. Recent research indicates that integrating local wisdom with STEM can enhance students' creative thinking and communication skills [Yolida et al.,\(2025\)](#) , while the issue of local wisdom in science education can strengthen science literacy ([Verawati & Wahyudi, 2024](#)) . Therefore, the positioning of these themes on the thematic map can be interpreted as opportunities for future research, not as weaknesses in the field of study.

4.6. Thematic Evolution and Future Research Directions

This section presents an analysis of trending topics and thematic evolution to address RQ5, specifically the development of themes over time and the direction of future research. Figure 13 shows that the term “education” emerged earlier and has a longer timeframe. The terms “human” and “students” appear to stand out around 2022, while “science education,” “local wisdom,” and “indigenous knowledge” gain prominence around 2024. The terms “ethnoscience,” “STEM,” and “indigenous knowledge systems” emerged as newer topics and tend to point toward the 2025 period. This pattern indicates that research has shifted from general discussions of

education toward more specific themes, such as ethnoscience, STEM education, and indigenous knowledge systems.

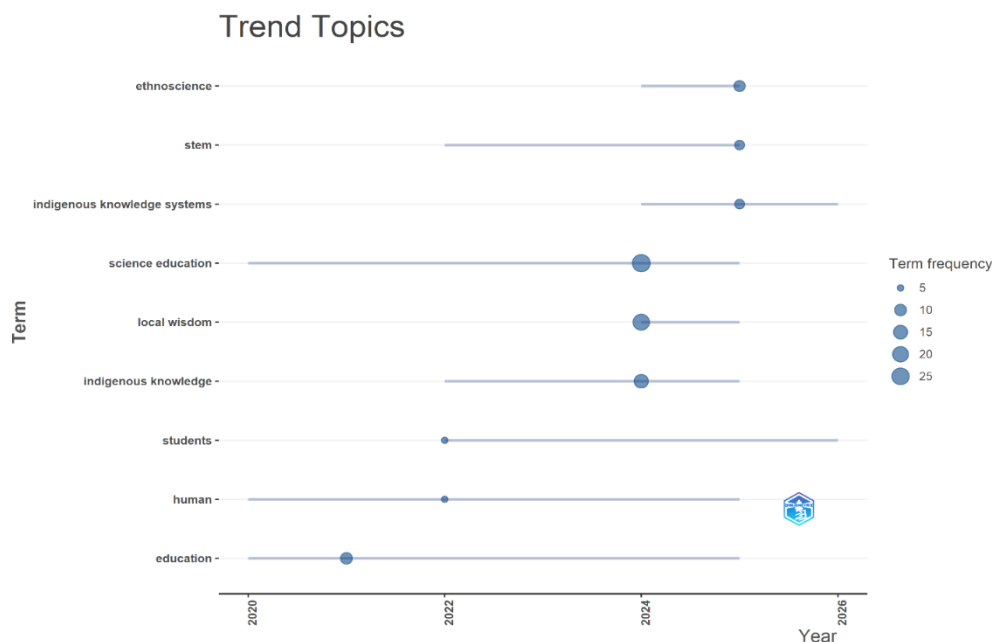


Figure 13. Trend Topic

This shift indicates that research on local wisdom-based science education is increasingly moving from a general conceptual orientation toward the development of more applied and specific themes. The emergence of ethnoscience and STEM as new topics suggests that local wisdom is beginning to be positioned as the foundation for science learning innovation that emphasizes not only conceptual understanding but also critical thinking skills, problem-solving, and science literacy. Fadillah et al.,(2025) show that ethnoscience is gaining increasing attention within the academic community as a culture-based approach to addressing global challenges, with recent themes focusing on critical thinking, problem solving, scientific literacy, and context-based learning. Sutrimo et al.,(2025) found that the keyword “local wisdom” has a strong association with science education, character education, and ethnoscience, and recommended the development of a model for integrating local wisdom into STEM education and character education.

Figure 14 illustrates the evolution of themes from the 2016–2024 period to the 2025–2026 period. In the initial period, emerging themes included biology, local wisdom, education, human, ethnoscience, science- -education, indigenous knowledge, and sustainability. In the 2025–2026 period, these themes evolved into education, local wisdom, ethnoscience, sustainability, science education, teacher training, and ethnochemistry. This shift indicates that the field of local wisdom-based science education is deepening from general concepts toward more specific pedagogical implementation and disciplinary content.

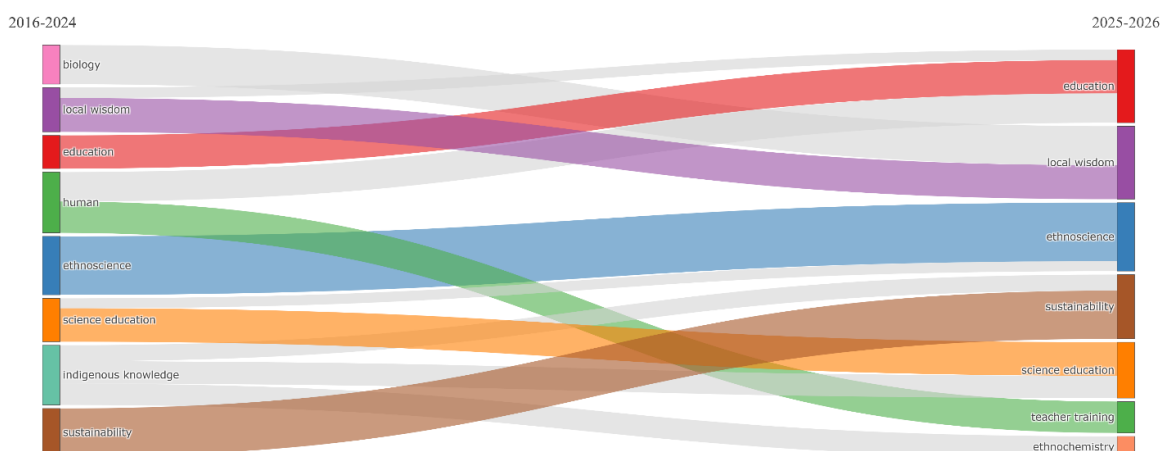


Figure 14. Thematic Evolution

The evolution of themes toward teacher training and ethnochemistry indicates that recent research not only maps local wisdom as a learning context but also begins to emphasize teacher readiness and a deeper

understanding of disciplinary content. Muskania et al.,(2024) demonstrate that the development of STEM-PjBL-based science instructional materials integrated with local values requires attention to teachers' perspectives and needs; thus, the emergence of the teacher training theme in the evolutionary map can be understood as a response to the need for implementing culture-based learning in the classroom. Additionally, Junaidi et al.,(2025) explain that ethnochemistry connects cultural practices with chemical concepts to create more meaningful, inclusive, and multicultural learning. These findings are further supported by (Hunaepi et al., 2024), which demonstrates that local wisdom can be mapped into concepts in biology, physics, and chemistry. The evolution of themes in Figure 14 indicates that future research directions are shifting toward strengthening teacher competencies, developing culture-based instructional materials, and integrating local wisdom into more specific and applied subfields of science.

Future research directions should also strengthen the relationship between local wisdom, scientific literacy, STEM education, and sustainability education. The position of scientific literacy in the thematic map indicates that this theme has not yet become a central focus of the field, even though scientific literacy is one of the key outcomes in contextual science learning. Verawati & Wahyudi (2024) demonstrate that the issue of local wisdom in science learning can enhance students' scientific literacy. Yasir et al.,(2024) also show that local wisdom-based science learning can strengthen conservation attitudes toward cultural heritage. Both findings support a research development direction that not only assesses conceptual understanding but also evaluates literacy, conservation attitudes, cultural identity, and higher-order thinking skills.

Overall, the thematic evolution map indicates that local wisdom-based science education is evolving from conceptual issues toward a more applied research agenda. Future research directions can focus on five areas. First, researchers need to develop empirically validated models of local wisdom-based science education across various educational levels. Second, researchers need to expand studies into subdisciplines such as ethnochemistry, ethnobiology, ethnopysics, and environmental education. Third, research needs to strengthen teacher training so that teachers can integrate local knowledge accurately, ethically, and scientifically. Fourth, cross-national research needs to be expanded so that the concepts of local wisdom and indigenous knowledge are not narrowly understood within a single cultural context. Fifth, researchers need to combine bibliometrics with systematic literature reviews or content analysis so that quantitative maps can be supplemented with qualitative understanding of learning strategies, student achievements, and implementation challenges.

This bibliometric mapping indicates that science education research grounded in local wisdom has experienced strong growth, features major contributors from Indonesia and several countries with traditions of indigenous studies, and forms a thematic structure linking science education, local knowledge, ethnoscience, STEM, and sustainability. These findings clarify that local wisdom is not merely an additional context in science learning, but a source of pedagogical and epistemological knowledge that can strengthen the relevance of science for students, society, and the environment.

5. CONCLUSION

This study concludes that research on science education based on local wisdom has shown positive development in *Scopus-indexed* literature from 2016 to 2026, marked by consistent publication growth, the involvement of diverse authors, institutions, and countries, and the formation of a knowledge structure linking *science education, local wisdom, indigenous knowledge, ethnoscience, STEM, biology, and sustainability*. Bibliometric findings indicate that local wisdom functions not only as a cultural context in science learning but also as a source of pedagogical knowledge that can strengthen the relevance of scientific concepts to students' lives, science literacy, environmental awareness, and culturally responsive learning. The evolution of themes reveals a shift in research focus from general discussions on education and local knowledge toward more specific themes, such as *ethnoscience, teacher training, ethnochemistry, STEM education, and sustainability education*. Further research is recommended to develop empirical studies on the implementation of local wisdom-based science learning across various educational levels and science subfields, to strengthen research on teacher readiness and instructional material design, and to combine bibliometric analysis with *systematic literature reviews* or content analysis so that quantitative mapping can be complemented by a deeper understanding of the strategies, challenges, and impacts of local wisdom-based learning.

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REFERENCES

- Aikenhead, G. S. (1996). Science Education: Border Crossing into the Subculture of Science. *Studies in Science Education*, 27(1), 1–52. <https://doi.org/10.1080/03057269608560077>

- Ainaya, S., Liliawati, W., & Rusyati, L. (2026). Quantifying Research Productivity: A Bibliometric Analysis of Ethnoscience. *Journal of Science Education Research*, 10(1 SE-Articles), 61–74. <https://doi.org/10.21831/jser.v10i1.72928>
- Alkhamash, R. (2023). Bibliometric, network, and thematic mapping analyses of metaphor and discourse in COVID-19 publications from 2020 to 2022. *Frontiers in Psychology*, Volume 13. <https://doi.org/https://doi.org/10.3389/fpsyg.2022.1062943>
- Angela, J., & Samantha, E. (2020). Culturally Relevant Pedagogy: A Model To Guide Cultural Transformation in STEM Departments. *Journal of Microbiology & Biology Education*, 21(1), 10.1128/jmbe.v21i1.2097. <https://doi.org/10.1128/jmbe.v21i1.2097>
- Ardianti, S. D., & Raida, S. A. (2022). The Effect of Project Based Learning with Ethnoscience Approach on Science Conceptual Understanding. *Journal of Innovation in Educational and Cultural Research; Vol 3, No 2 (2022)DO - 10.46843/Jiecr.V3i2.89*. <https://doi.org/https://doi.org/10.46843/jiecr.v3i2.89>
- Aria, M., & Cuccurullo, C. (2026). *Science mapping analysis. A primer with biblioshiny*. McGraw-Hill Education.
- Arjaya, I. B. A., Suastra, I. W., Redhana, I. W., & Sudiatmika, A. (2024). Global trends in local wisdom integration in education: A comprehensive bibliometric mapping analysis from 2020 to 2024. *International Journal of Learning, Teaching and Educational Research*, 23(7), 120–140. <https://doi.org/https://doi.org/10.26803/ijlter.23.7.7>
- Bagus, I., Arjaya, A., & Suastra, I. W. (2024). Global Trends in Local Wisdom Integration in Education : A Comprehensive Bibliometric Mapping Analysis from 2020 to 2024. *International Journal of Learning, Teaching and Educational Research*, 23(7), 120–140.
- Bang, M., & Medin, D. (2010). Cultural processes in science education: Supporting the navigation of multiple epistemologies. *Science Education*, 94(6), 1008–1026. <https://doi.org/https://doi.org/10.1002/sce.20392>
- Berkes, F. (2012). *Sacred Ecology*. Routledge. <https://doi.org/https://doi.org/10.4324/9780203123843>
- Brown, J. C. (2017). A metasynthesis of the complementarity of culturally responsive and inquiry-based science education in K-12 settings: Implications for advancing equitable science teaching and learning. *Journal of Research in Science Teaching*, 54(9), 1143–1173. <https://doi.org/https://doi.org/10.1002/tea.21401>
- Cajete, G. A. (2020). Indigenous Science, Climate Change, and Indigenous Community Building: A Framework of Foundational Perspectives for Indigenous Community Resilience and Revitalization. In *Sustainability* (Vol. 12, Number 22, p. 9569). <https://doi.org/10.3390/su12229569>
- Chen, H., Tsang, Y., & Wu, C. (2023). When text mining meets science mapping in the bibliometric analysis: A review and future opportunities. *International Journal of Engineering Business Management*, 15, 18479790231222348. <https://doi.org/10.1177/18479790231222349>
- Çiftçi, Ş., Danişman, Ş., Yalçın, M., Tosuntaş, Ş., AY, Y., Sölpük, N., & Karadağ, E. (2016). Map of Scientific Publication in the field of Educational Sciences and Teacher Education in Turkey: A Bibliometric Study. *Educational Sciences: Theory & Practice*, 16, 1097–1123. <https://doi.org/10.12738/estp.2016.4.0009>
- Dei, D.-G. J., Anane-Donkor, L., Dzandza, P. E., Peasah, T., & Puttick, C. P. (2025). Synthesizing the Characteristics and Applications of Indigenous Knowledge for Sustainable Development: A Systematic Review. *Sage Open*, 15(3), 21582440251383844. <https://doi.org/10.1177/21582440251383843>
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133, 285–296. <https://doi.org/https://doi.org/10.1016/j.jbusres.2021.04.070>
- Druker-Ibanez, S., & Caceres-Jensen, L. (2022). Integration of indigenous and local knowledge into sustainability education: a systematic literature review. *Environmental Education Research*, 28(8), 1209–1236.
- Fadillah, M., Usmeldi, U., Lufri, L., Mawardi, M., & Festiyed, F. (2025). Publication Trends and Hot Topics in Ethnoscience Research: A Bibliometric Study. *Jurnal Ilmiah Wahana Pendidikan*, 11(8.A SE-Full Articles). <https://jurnal.peneliti.net/index.php/JIWP/article/view/10669>
- Fauzi, A., Siswati, B. H., & Ramadani, S. D. (2024). Low level of local wisdom-based biology education research: What should we do? *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 10(3 SE-Holistic Learning), 1098–1106. <https://doi.org/10.22219/jpbi.v10i3.36108>
- Febrian, A., Wilujeng, I., & Kun Prasetyo, Z. (2024). Literature Review: Development of Science Learning Based on Local Wisdom and Indigenous Knowledge for ESD. *KnE Social Sciences*, 9(13 SE-Articles), 704–716. <https://doi.org/10.18502/kss.v9i13.15989>
- Gay, G. (2018). *Culturally responsive teaching: Theory, research, and practice*. teachers college press.

- Handayani, R. D., Wilujeng, I., & Prasetyo, Z. K. (2018). Elaborating Indigenous Knowledge in the Science Curriculum for the Cultural Sustainability. *Journal of Teacher Education for Sustainability*, 20(2), 74–88. <https://doi.org/https://doi.org/10.2478/jtes-2018-0016>
- Hasibuan, H. Y., Syarifudin, E., Anwar, C., & Firdos, H. (2023). *Ethnoscience as the Policy Implementation of Kurikulum Merdeka in Science Learning: A Systematic Literature Review*. 9(8), 366–372. <https://doi.org/10.29303/jppipa.v9i8.4500>
- Hassan, W., & Duarte, A. E. (2024). Bibliometric analysis: A few suggestions. *Current Problems in Cardiology*, 49(8), 102640. <https://doi.org/https://doi.org/10.1016/j.cpcardiol.2024.102640>
- Hicks, D., Wouters, P., Waltman, L., de Rijcke, S., & Rafols, I. (2015). Bibliometrics: The Leiden Manifesto for research metrics. *Nature*, 520(7548), 429–431. <https://doi.org/10.1038/520429a>
- Hidaayatullaah, H. N., Suprpto, N., Hariyono, E., Prahani, B. K., & Wulandari, D. (2021). Research Trends on Ethnoscience based Learning through Bibliometric Analysis: Contributed to Physics Learning. *Journal of Physics: Conference Series*, 2110(1), 12026. <https://doi.org/10.1088/1742-6596/2110/1/012026>
- Hunaepi, H., Suastra, I. W., Arnyana, I. B. P., & Hasbullah, H. (2024). Ethnoscience: Mapping the Potential of Sasak Local Wisdom as a Source of Science Learning. *Reflection Journal*, 4(2 SE-Articles), 62–76. <https://doi.org/10.36312/rj.v4i2.2594>
- Jannah, M., Noris, M., & Indriyani, I. (2023). Trends and Issues of Ethnoscience Research from 2008 to 2023: A Bibliometric Analysis. *Jurnal Penelitian Pendidikan IPA*, 9(9 SE-Review), 621–633. <https://doi.org/10.29303/jppipa.v9i9.4771>
- Julianti, M., Aina, T., Prasiwi, J., Fatonatullaillah, I., Widiyastuti, W., & Usman, U. (2025). Exploring Ethnoscience-Oriented PjBL-STEM Model Implementation in Biology Education: A Traditional Food Context Study. *International Journal of STEM Education for Sustainability*, 5(2), 257–261. <https://doi.org/https://doi.org/10.53889/ijses.v5i2.696>
- Junaidi, E., Sudatha, I. G. W., Suartama, I. K., & Santosa, M. H. (2025). Ethnochemistry In Chemistry Learning: Insights from Indonesian Local Wisdom. *Jurnal Pendidikan MIPA*, 26(September), 1642–1658. <https://doi.org/10.23960/jpmipa.v26i3.pp1642-1658>
- Kadirhanoğulları, M. K., & Köse, E. Ö. (2023). Bibliometric Analysis: Technology Studies in Science Education. *International Journal of Technology in Education and Science*, 7(2 SE-Articles), 167–191. <https://doi.org/10.46328/ijtes.469>
- Kılıç, M., Evci, S., & Kefe, İ. (2024). The Conceptual, Social, and Intellectual Structure of the Financial Information/Accounting Manipulation Literature: A Bibliometric Analysis. In *Journal of Risk and Financial Management* (Vol. 17, Number 7, p. 297). <https://doi.org/10.3390/jrfm17070297>
- Kobori, H., Dickinson, J. L., Washitani, I., Sakurai, R., Amano, T., Komatsu, N., Kitamura, W., Takagawa, S., Koyama, K., Ogawara, T., & Miller-Rushing, A. J. (2016). Citizen science: a new approach to advance ecology, education, and conservation. *Ecological Research*, 31(1), 1–19. <https://doi.org/https://doi.org/10.1007/s11284-015-1314-y>
- Latip, A., Hernani, & Kadarohman, A. (2024). Local and indigenous knowledge (LIK) in science learning: A systematic literature review. *Journal of Turkish Science Education*, 21(4 SE-Articles), 651–667. <https://doi.org/https://doi.org/10.36681/tused.2024.035>
- Lim, L., Tan, M., & Saito, E. (2019). Culturally relevant pedagogy: Developing principles of description and analysis. *Teaching and Teacher Education*, 77, 43–52. <https://doi.org/https://doi.org/10.1016/j.tate.2018.09.011>
- Lim, W. M., Kumar, S., & Donthu, N. (2024). How to combine and clean bibliometric data and use bibliometric tools synergistically: Guidelines using metaverse research. *Journal of Business Research*, 182, 114760. <https://doi.org/https://doi.org/10.1016/j.jbusres.2024.114760>
- Murwitaningsih, S., & Maesaroh, M. (2023). Ethnoscience in Indonesia and Itâ€™s Implication to Environmental Education: A Systematic Literature Review. *Jurnal Penelitian Pendidikan IPA*, 9(10 SE-Review), 903–911. <https://doi.org/10.29303/jppipa.v9i10.5447>
- Muskania, R. T., Maksum, A., & Astra, I. M. (2024). A Qualitative Study of Teacher’s Perspective about Digital STEM-PjBL Teaching Material Based on Local Wisdom to Improve Scientific Literacy. *Pegem Journal of Education and Instruction*, 14(2 SE-Article), 94–103. <https://doi.org/10.47750/pegegog.14.02.11>
- Nurhasnah, N., Lufri, L., & Asrizal, A. (2022). Effect Size Analysis of the Implications Ethnoscience Approach to the Improvement of 21st Century Skills in Science Learning. *Jurnal IPA & Pembelajaran IPA*, 6, 287–299. <https://doi.org/10.24815/jipi.v6i3.26116>
- Ogawa, M. (1995). Science education in a multiscience perspective. *Science Education*, 79(5), 583–593. <https://doi.org/https://doi.org/10.1002/sce.3730790507>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L.,

- Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, 372, n71. <https://doi.org/http://dx.doi.org/10.1136/bmj.n71>
- Rahman, A. A., Santosa, T. A., Nurtamam, M. E., Widoyo, H., & Rahman, A. (2023). Meta-Analysis: The Effect of Ethnoscience-Based Project Based Learning Model on Students' Critical Thinking Skills. *Jurnal Penelitian Pendidikan IPA*, 9(9 SE-Review), 611–620. <https://doi.org/10.29303/jppipa.v9i9.4871>
- Rahmawan, S., & Rahayu, D. (2023). Bibliometric Methods: Analysis of the Development Potential of Ethnoscience-based Science Literacy Modules in Chemistry Learning. *Indonesian Journal of Science and Education*, 7, 45–56. <https://doi.org/10.31002/ijose.v7i2.1104>
- Sari, T., & Aypay, A. (2024). A Bibliometric Study of Issues in Educational Policy. In *Education Sciences* (Vol. 14, Number 6, p. 568). <https://doi.org/10.3390/educsci14060568>
- Senanayake, S. G. J. N. (2006). Indigenous knowledge as a key to sustainable development. *Journal of Agricultural Sciences – Sri Lanka*, 2, 87–94. <https://doi.org/10.4038/jas.v2i1.8117>
- Setianingrum, D. A., Jumadi, J., Suyanta, S., Nurohman, S., Astuti, S. R. D., & Fikri, I. N. (2023). Bibliometric Analysis: Trends Research on Local Wisdom in Science Learning and Its Implications for Strengthening Love Local Culture. *Journal of Science and Science Education*, 4(1 SE-Articles), 1–10. <https://doi.org/10.29303/jossed.v4i1.3530>
- Sihombing, R., Anwar, S., Liu, S.-Y., Muslim, M., Winarno, N., & Sihombing, P. (2025). Integrating Local Wisdom into Environmental Education: A Systematic Review of Ethnoscience Research in Indonesia. *Journal of Natural Science and Integration*, 8, 57. <https://doi.org/10.24014/jnsi.v8i1.35762>
- Suciati. (2023). Integrating local wisdom in science learning: An opportunities and challenges. *AIP Conference Proceedings*, 2619(1), 100018. <https://doi.org/10.1063/5.0125371>
- Sunarti, T., Suprpto, N., Suliyanah, Satriawan, M., & Hidaayatullaah, H. N. (2024). Research Trends on Ethnoscience in Physics Learning (EPL): A Bibliometric Network Analysis. *Studies in Learning and Teaching*, 5(1 SE-Articles), 268–281. <https://doi.org/10.46627/silet.v5i1.372>
- Sutrimo, M. S., Retnawati, H., Ulwiyah, S., Fauzan, M. I., Salsabila, A., & Iqbal, M. (2025). Bibliometric Research Trends of Local Wisdom in Science Education: Mapping Publications, Collaborations, and Implications. *Prisma Sains : Jurnal Pengkajian Ilmu Dan Pembelajaran Matematika Dan IPA IKIP Mataram*, 13(3 SE-Research Articles), 673–688. <https://doi.org/10.33394/j-ps.v13i3.15401>
- Tahamtan, I., & Bornmann, L. (2019). What do citation counts measure? An updated review of studies on citations in scientific documents published between 2006 and 2018. *Scientometrics*, 121(3), 1635–1684. <https://doi.org/10.1007/s11192-019-03243-4>
- Verawati, N., Harjono, A., Wahyudi, W., & Gummah, S. (2022). Inquiry-Creative Learning Integrated with Ethnoscience: Efforts to Encourage Prospective Science Teachers' Critical Thinking in Indonesia. *International Journal of Learning, Teaching and Educational Research*, 21, 232–248. <https://doi.org/10.26803/ijlter.21.9.13>
- Verawati, N. N. S. P., & Wahyudi, W. (2024). Raising the Issue of Local Wisdom in Science Learning and Its Impact on Increasing Students' Scientific Literacy. *International Journal of Ethnoscience and Technology in Education*, 1(1 SE-Articles), 42–54. <https://doi.org/10.33394/ijete.v1i1.10881>
- Waltman, L. (2016). A review of the literature on citation impact indicators. *Journal of Informetrics*, 10(2), 365–391. <https://doi.org/https://doi.org/10.1016/j.joi.2016.02.007>
- Yasir, M., Hartiningsih, T., & Rahma, A. A. (2024). The influence of local wisdom-based science learning on the cultural heritage conservation character. *Research and Development in Education (RaDEn)*, 4(2 SE-Articles), 1418–1434. <https://doi.org/10.22219/raden.v4i2.33420>
- Yazidi, R. El, & Rijal, K. (2024). Science Learning in the Context of “Indigenous Knowledge” for Sustainable Development. *International Journal of Ethnoscience and Technology in Education*, 1(1 SE-Articles), 28–41. <https://doi.org/10.33394/ijete.v1i1.10880>
- Yolida, B., Marpaung, R. R. T., Priadi, M. A., Maulina, D., Ainiyah, I., & Ibrahim, N. H. (2025). Local Wisdom Napai-Based STEM Learning (LW-STEM) Improves Creative Thinking (CT) and Communication Skills in Students. *BIOSFER : JURNAL TADRIS BIOLOGI*, 16(1), 9–23. <https://doi.org/https://doi.org/10.24042/biosfer.v16i1.26784>
- Zidny, R., & Eilks, I. (2020). Integrating perspectives from indigenous knowledge and Western science in secondary and higher chemistry learning to contribute to sustainability education. *Sustainable Chemistry and Pharmacy*, 16, 100229. <https://doi.org/https://doi.org/10.1016/j.sep.2020.100229>
- Zidny, R., Sjöström, J., & Eilks, I. (2020). A Multi-Perspective Reflection on How Indigenous Knowledge and Related Ideas Can Improve Science Education for Sustainability. *Science & Education*, 29(1), 145–

185. <https://doi.org/10.1007/s11191-019-00100-x>

Zupic, I., & Čater, T. (2015). Bibliometric Methods in Management and Organization. *Organizational Research Methods*, 18, 429–472. <https://doi.org/10.1177/1094428114562629>