

Mapping Research Trends in the Development of Local Wisdom-Based Teaching Modules to Improve Science Literacy: A Review

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Abstract: Local wisdom-based learning modules are teaching materials that integrate cultural practices, values, and local environmental contexts to create meaningful science learning experiences. In the context of science learning, the use of local wisdom-based modules has been proven effective in improving students' scientific literacy, as students not only understand the concepts but also relate them to real phenomena in their daily lives. This study aims to identify and analyze research trends regarding the development of local wisdom-based learning modules to improve scientific literacy. The methods used are descriptive and analytical. Data were obtained from documents indexed by Google Scholar and Dimensions for the period 2016–2025 using the Publish or Perish and Dimension.ai tools. The data analyzed included the type of publication, publication source, and the most cited research title. Data analysis was conducted using bibliometric methods with the help of VOSviewer software. The results of the analysis show that the research trend from 2016 to 2025 experienced a significant increase, although there was a slight decrease in 2025 due to the incompleteness of the current year's data. Numerous documents, including articles, proceedings, book chapters, preprints, monographs, and edited books, discuss the development of local wisdom-based modules to strengthen scientific literacy. Keywords frequently used in this research include: *local wisdom, science literacy, education, culture, digital literacy, and learning.*

Keywords: Bibliometric analysis; Learning modules; Local wisdom; Science education; Science literacy

Introduction

The development of science and technology in the 21st century requires students to possess new literacy skills, particularly scientific literacy, which forms the basis for responsible decision-making in personal, social, and global life. Scientific literacy is no longer merely understanding concepts but also includes the ability to apply scientific knowledge, identify questions, evaluate evidence, and make science-based decisions in real-world situations (OECD, 2015; 2025). In line with this shift, curricula in various countries, including Indonesia, through the Independent Curriculum, emphasize

contextual, meaningful learning, and a focus on competency development.

In the context of Indonesian education, local wisdom is a strategic learning resource for bringing science learning closer to students' lives. Integrating local wisdom into teaching modules is believed to bridge the understanding of scientific concepts with the cultural, social, and ecological realities of the places where students live, thereby increasing the relevance of learning (Sudarmin et al., 2023; Rachmadyanti et al., 2021). This approach not only strengthens appreciation for local culture but also fosters scientific skills such as observation, inference, argumentation, and problem-solving through phenomena familiar to everyday life

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(Wilujeng et al., 2019; Dewi et al., 2019; Hikmawati et al., 2021).

As attention to the development of local wisdom-based teaching modules has increased, various studies have been conducted to evaluate their effectiveness in improving scientific literacy (Sukmawati, et al., 2022; Hadisaputra, et al., 2020), scientific process skills (Husin, et al., 2024; Suastra, et al., 2021), critical thinking skills (Mulatsih, et al., 2023; Anwar, et al., 2024), and attitudes towards the environment (Wahyuningtyas, et al., 2021; Hunaepi, et al., 2019). Various learning models and educational product development, such as problem-based learning (PBL), project-based learning (PjBL), and the 4D model, are widely used in designing teaching modules integrated with local wisdom (Safitri et al., 2024; Retnowati et al., 2020; Susanto et al., 2023; Guslinda et al., 2024). However, to date, there have been few comprehensive studies that map research trends related to this topic over time, in terms of the number of publications, study focus, development methods, dominant learning models, or measured learning outcomes.

The absence of research trend mapping creates difficulties in discerning the direction of scientific development, identifying research gaps, and recognising the potential for innovation in developing local wisdom-based teaching modules to enhance scientific literacy in a more structured manner. Therefore, a systematic or bibliometric review is needed to comprehensively describe the patterns, trends, and developments of research on this topic. Based on this urgency, this article aims to map research trends in developing local wisdom-based teaching modules that aim to improve scientific literacy by examining dominant themes, development approaches, learning models, indicators for assessing scientific literacy, and potential future research directions. The results of this study are expected to contribute to researchers, curriculum developers, and educators in optimizing the use of local wisdom as a foundation for contextual, relevant, and sustainable science learning.

Method

This study employs a descriptive-qualitative approach, incorporating a review study, to map research trends on the development of local wisdom-based learning modules that aim to enhance scientific literacy. This approach was chosen because it provides a comprehensive overview of topic developments, methods used, and research trends based on relevant scientific publications. Data were obtained from scientific publications available on Dimensions, and other publication databases, which are publicly accessible. The range of years studied is 2016–2025 to

comply with the latest developments related to local wisdom modules and scientific literacy (Rodriguez & Storer, 2020). Data collection was conducted using the Publish or Perish (PoP) device to obtain publication metadata, including the number of publications, citations, publication types, and annual trends (Rada et al., 2020).

The first stage of the data search was conducted through Dimensions using the keywords “Development of Local Wisdom Modules” and “Science Literacy.” The goal was to monitor annual publication trends, including the number of journal articles, proceedings, books, and book chapters published. These search results provided an initial overview of the development of research on local wisdom-based module development and science literacy globally. The search was then further enhanced using the Publish or Perish tool, which utilised the same keywords to obtain more detailed publication metadata, including the number of citations, H-index, publication distribution by year, and the most productive publication sources. The collected data were then exported and analysed using VOSviewer software to map keyword networks, relationships between themes, and visualise topic development through network visualisation, density visualisation, and overlay visualisation. This analysis helped identify patterns, key focuses, and research trends in the development of local wisdom-based modules designed to enhance science literacy.

Result and Discussion

This study aims to describe research trends in the development of local wisdom-based teaching modules designed to enhance scientific literacy between 2016 and 2025. Research documents were obtained from various scientific publication sources indexed in Dimensions and Google Scholar during that period. Figure 1 below illustrates research trends regarding the development of local wisdom-based modules designed to enhance scientific literacy. The figure shows that the research trend has increased from year to year, particularly since 2018, reaching its peak in 2023. This increase in the number of publications indicates that researchers' attention to contextual science learning integrated with local cultural values is getting stronger and developing sustainably (Jauhari, 2025; Afnan, 2024).

However, in 2025, the research trend on developing local wisdom-based teaching modules to improve scientific literacy showed a slight decline. This decline was not due to a decrease in research interest, but rather because the 2025 publication data had not yet been fully collected, so the preliminary figures still appeared lower than the previous year. In general, the increase in research trends from 2018 to 2024 was strongly

influenced by the demands of 21st-century education, which emphasize the importance of scientific literacy, critical thinking skills, problem-solving, and culturally based contextual understanding (Zuhri, 2024). In 2016, only around 400 publications on this topic were identified, which then increased to more than 600 publications in 2020 and continued to grow to

approximately 1,260 publications in 2024. This increasing research trend indicates a growing awareness that students' scientific literacy needs to be improved through learning approaches that are relevant to their lives, one of which is by utilizing local wisdom as a learning context. Muliati & Suhendra, 2025; Saleng & Syatriana, 2025).

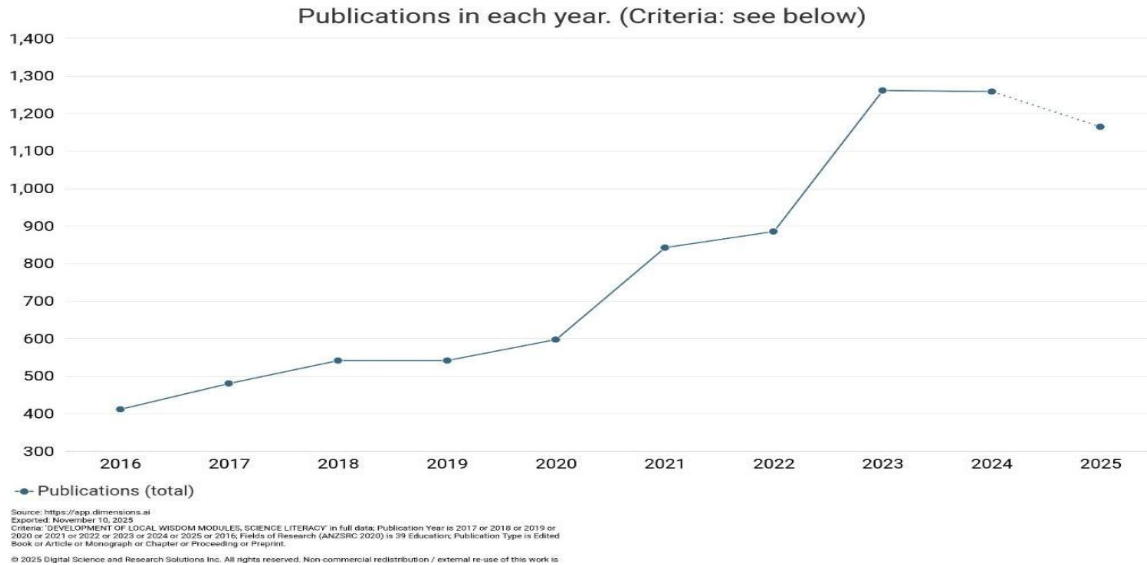


Figure 1. Research Search Regarding the Development of Local Wisdom and Scientific Literacy Modules

Various studies have demonstrated that local wisdom-based modules can enhance scientific literacy by integrating cultural values, environmental phenomena, and more authentic learning activities (Nirmala Septiana, 2023; Dewi, 2025). Table 1 below presents publication categories related to research trends in the development of local wisdom-based teaching modules aimed at improving scientific literacy, categorised by publication type.

Table 1. Tend based on Publication Types

Publication Types	Publications
Article	2,394
Edited Book	2,848
Chapter	915
Monograph	1,565
Proceeding	191
Preprint	67

Based on Table 1, research on the development of local wisdom-based teaching modules to improve scientific literacy from 2016 to 2025 is divided into six types of publications. Journal articles dominate with 2,394 publications, followed by edited books with 2,848, book chapters with 915, and monographs with 1,565. Furthermore, publications in proceedings numbered 191 documents, while preprints were the category with the lowest number of documents, at 67 documents. These

data indicate that journal articles are the most common form of publication containing research results on the development of local wisdom-based modules. This indicates that this topic is a primary focus in the scientific community, resulting in numerous publications in educational journals and other science journals (Mu'yidarramatillah, 2024; Puspita, 2025).

In contrast, preprints are the smallest publication type, indicating that many researchers prefer formal publication. Previous research has stated that a scientific article is a factual work of a certain length, created for online or print publication, with the aim of conveying ideas and findings in a convincing and educational manner (Rusdiana, 2019; Kusumaningsih, 2023). Typically, scientific articles are published in journals that provide a platform for researchers to disseminate their research findings, both physically and digitally (Suseno & Fauziah, 2020). Therefore, the dominance of journal articles in this study indicates that the development of local wisdom-based modules has a strong scientific basis and continues to grow as a relevant field in today's science education.

The dominance of journal articles in this mapping also suggests that they are frequently cited in research. Table 2 below presents ten journals that are trending in research on the development of local wisdom-based teaching modules to enhance scientific literacy.

Table 2. Top 10 Sources journal Research Trends on the Development of Local Wisdom-Based Teaching Modules to Improve Science Literacy

Journal Name	Publication	Citation	Citation Mean
Journal of Science Education Research	215	611	2.84
Advances in Social Science, Education and Humanities Research	154	197	1.28
NWU Self-Directed Learning Series	120	481	4.01
Lecture Notes in Educational Technology	50	742	14.48
SSRN Electronic Journal	39	118	3.03
Springer International Handbooks of Education	39	530	13.59
AIP Conference Proceedings	38	31	0.82
Communications in Computer and Information Science	37	88	2.38
Elementary School Scientific Journal	31	181	5.84
Indonesian Journal of Science Education	29	493	17.00

Table 2 presents the top ten publication sources most frequently cited in studies on trends in the development of local wisdom-based learning modules to enhance scientific literacy. The most productive source is the Journal of Science Education Research, with a total of 215 publications, 611 citations, and an average of 2.84 citations per article. This journal publishes various scientific articles focused on research findings in science, technology, and science learning, making it a primary platform for researchers to publish their work on local wisdom-based module development. First published in 2015, all editions are open access, allowing articles to be freely accessed, downloaded, copied, and distributed. This free access contributes to the increase in citations and the use of articles as references in further research (Oktavia, 2019; Sari, 2025).

Besides *Journal of Science Education Research*, other publication sources that also contain a lot of related research are *Advances in Social Science, Education and*

Humanities Research, Lecture Notes in Educational Technology, SSRN Electronic Journal, And Elementary School Scientific Journal. The productivity of these sources shows that studies on local wisdom modules are not only published in science education journals, but also in multidisciplinary journals that discuss educational technology, contextual learning, and cultural value-based educational innovations (Ismail, 2024; Erman).

After analyzing the ten most frequently cited journals, the next step was to review the most frequently cited article titles. A comprehensive overview of research development in the field of developing local wisdom-based teaching modules, particularly in improving scientific literacy, was obtained by analyzing the articles with the highest citation rates over the past decade. This citation mapping is presented in Table 3, which lists the ten most highly cited publications considered to be the most influential in determining research trends in this field.

Table 3. Top 10 Citations on Research Trends in the Development of Local Wisdom-Based Teaching Modules to Improve Science Literacy

Cited/Year	Year	Writer	Article Title
42.00	2017	B. Setiawan, DK. Innatesari,	The development of local wisdom-based natural science module to improve science literation of students
33.00	2024	NNSP. Verawati, W. Wahyudi	Raising the issue of local wisdom in science learning and its impact on increasing students' scientific literacy
14.20	2020	PW. Hastuti, W. Setianingsih	How to develop students' scientific literacy through integration of local wisdom in Yogyakarta on science learning?
5.33	2022	L. Setyorini, S. Haryani	Development of e-module based on local wisdom to improve science literacy and reading literacy
5.00	2023	GSM. Rashid, O. Kurniaman	Development of local wisdom-based literacy modules for reading comprehension in elementary school
4.50	2021	NS. Latif, A. Talib	Development of ethnomathematics e-modules based on local wisdom to improve students' cultural and civic literacy
4.00	2025	N. Nurhayati, D. Jaenudin,	Development of E-Modules Based on Local Wisdom on Ecosystem Material to Increase Scientific Literacy
1.50	2023	NN. Rediani, BR. Kaize, S. Hanif	Developing Environmental Care Attitudes and Scientific Literacy through Sasi Local Wisdom-Based E-Modules
1.00	2025	BNS. Zainuri, G. Gunawan, K.K	Validity of PBL E-Modules Integrated with Local Wisdom in Improving Students' Literacy and Science Process Skills
1.00	2024	Mr. Faizin	Development of E-Modules Containing Ethno-STREAM Integrated Local Wisdom in Science Learning to Increase Environmental

Table 3 displays the ten most frequently cited article titles in research on trends in the development of local wisdom-based teaching modules. The most frequently cited article is Setiawan et al.'s (2017) work, "The Development of Local Wisdom-Based Natural Science Module to Improve Students' Science Literacy," with an average of 42 citations per year. This article serves as a primary reference because it empirically demonstrates that integrating local wisdom into learning modules can significantly enhance students' science literacy. Other articles, such as Verawati & Wahyudi (2024) and Hastuti et al. (2020), also receive numerous citations for discussing strategies for implementing local wisdom in science learning and its impact on students' science literacy skills.

The high number of citations to these articles demonstrates that the topic of developing local wisdom-based teaching modules has made a significant contribution to strengthening scientific literacy and has significantly influenced the direction of science education research in Indonesia and globally. Many researchers have subsequently used these works as a conceptual and methodological basis for developing local culture-based learning modules at various levels of education.

To clarify the focus and research trends in the development of local wisdom-based teaching modules aimed at improving scientific literacy, an analysis of the most frequently appearing keywords in related publications was conducted. This keyword mapping facilitated the identification of key themes, key concepts, and the direction of research development over the past ten years. A summary of these keywords is presented in Table 4.

Table 4. Keywords on Research Trends in the Development of Local Wisdom-Based Teaching Modules to Improve Science Literacy

Term	Occurrences	Relevance
Effectiveness	5	5.82
Research	28	1.54
Context	5	1.51
digital literacy	5	0.97
local wisdom	120	0.95
Value	19	0.73
science education	6	0.67
Learning	13	0.61
Form	13	0.46
Culture	11	0.45

Table 4 shows that the most frequently appearing keyword in studies on the development of local wisdom-based teaching modules to improve scientific literacy is "local wisdom," with a total of 120 occurrences and a relevance score of 0.95. This indicates that local wisdom is a primary focus in various studies on the

development of learning modules. Many studies emphasize the importance of cultural values, traditional practices, and local environmental phenomena as the primary context for strengthening students' scientific literacy (Bukhari, 2023).

Furthermore, the keywords "effectiveness," "context," and "value" also appear frequently, indicating that research focuses not only on module development but also on the effectiveness of its implementation in the classroom. Many studies have examined how the integration of local wisdom can enhance students' conceptual understanding, critical thinking skills, and scientific attitudes through contextual and meaningful learning (Nurjanah, 2024). The keywords "digital literacy" and "technology" also appear significantly, indicating a recent trend toward the development of digital modules or e-modules based on local wisdom. This development aligns with the needs of the Society 5.0 era and the post-pandemic learning transformation, where the use of technology is a crucial part of improving the quality of science learning. Several studies confirm that e-modules based on local wisdom can increase learning interest, enrich learning resources, and support students' independent learning (Susanti, 2025).

Keywords such as culture and science education also feature prominently in the mapping, demonstrating that integrating local culture is a key approach in science education. Several articles discuss how local values, practices, and knowledge can serve as the foundation for building scientific literacy that is relevant to students' lives and simultaneously fosters a love of local culture (Arma, 2024). Findings from Table 4 indicate that research on local wisdom-based modules focuses not only on cultural aspects but also integrates them with technology, learning contexts, and pedagogical effectiveness. This demonstrates that the integration of local wisdom has evolved into a comprehensive and flexible learning approach suited to current educational needs.

Further analysis was conducted using Vosviewer, with the first results shown in Figure 2. This network visualization shows the relationships between terms that appeared in the research. Keywords grouped into several clusters are visualised in different colours, indicating interrelated themes in the development of local wisdom-based learning modules to improve scientific literacy. Each cluster represents a specific research focus, such as the integration of local cultural values, the effectiveness of learning modules, the use of technology in presenting materials, and the learning context at various educational levels. The results of this network analysis can be used to identify the most prominent and frequently used keywords in research over the past few years. This visualization shows that the

more frequently a keyword appears, the larger and brighter the network area representing that keyword becomes. This indicates that the topic plays a significant role in the conceptual construction of research on local wisdom-based learning.

Overall, the network visualization shows that research on local wisdom-based modules is strongly connected to the themes of education, culture, technology, and scientific literacy. The increasing number of keywords that emerge expands the visualization space and demonstrates the diversity of approaches used by researchers in developing contextual, relevant, and culturally-oriented teaching modules.

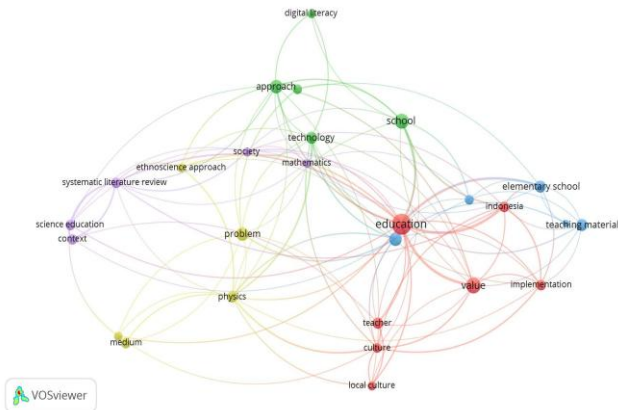


Figure 2. Network visualization on Research Trends in the Development of Local Wisdom-Based Teaching Modules to Improve Science Literacy

Next, Figure 3 presents an overlay visualization that provides an overview of the development of research themes from year to year based on the appearance of these keywords.

Figure 3 shows the keyword trends related to research on developing local wisdom-based teaching modules to improve scientific literacy in Google Scholar-indexed publications from 2016 to 2025. The development of article themes from the early to the current period is marked by a color gradation ranging from purple, blue, turquoise, dark green, light green, to yellow. These colors reflect the shifting focus of the research in each time period.

In this visualization, it can be seen that in the early years, such as 2018–2019, keywords that frequently appeared included *culture*, *local wisdom*, *value*, and *education*, which indicates that research during that period still focused on integrating local cultural values as a conceptual foundation for learning. This keyword indicates that researchers at that time were more focused on exploring how regional cultural characteristics could be used as a context for science learning to improve scientific literacy.

Entering 2021–2022, it is seen that keywords such as *asteaching material*, *elementary school*, *implementation*, and *developmentare* appearing more frequently and are visible in the light green area. This indicates a shift in research focus from cultural concepts to the development of concrete learning products, such as modules or e-modules based on local wisdom. During this period, numerous studies began to test the validity, practicality, and effectiveness of these modules in improving students' scientific literacy.

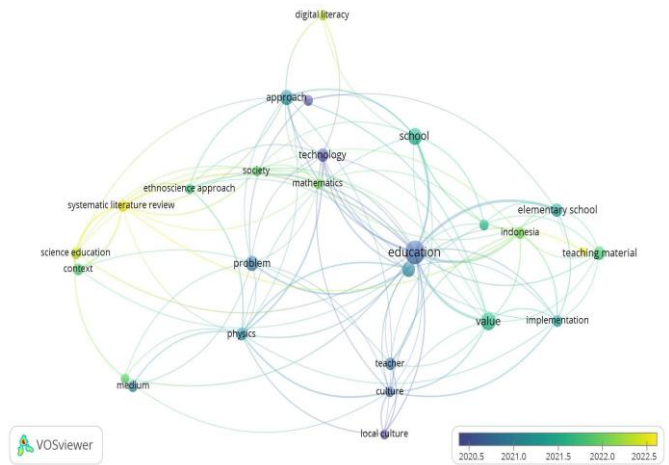


Figure 3. Overlay visualization on Research Trends in the Development of Local Wisdom-Based Teaching Modules to Improve Science Literacy

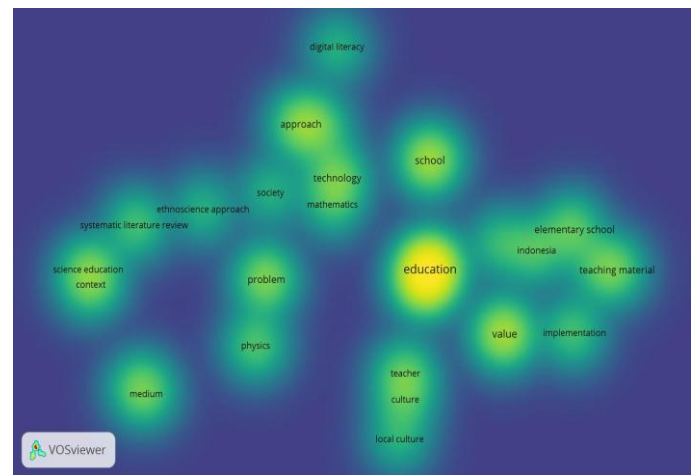


Figure 4. Density visualization on Research Trends in the Development of Local Wisdom-Based Teaching Modules to Improve Science Literacy

In more recent years, such as 2023–2024, the yellow color in the visualization indicates the emergence of more modern and innovative keywords, such as *digital literacy*, *technology*, *ethnoscience approach*, and *systematic literature review*. This indicates that current research is beginning to shift toward integrating digital technology into local wisdom-based modules, as well as the increasing use of systematic review approaches to

understand research developments more comprehensively.

Thus, Figure 3 shows that the direction of research has developed gradually, starting from a focus on local culture, then developing into the development of contextual teaching modules, and moving towards the application of more advanced scientific research technology and methodology. Research on the development of local wisdom-based teaching modules to improve scientific literacy is a rapidly growing field of study in recent years. Furthermore, Figure 4 presents a density visualization of the keywords appearing in the research.

In this visualization, theme density is indicated by a bright yellow color. The brighter the color, the more frequently the theme has been researched. Conversely, a dimmer color indicates that the theme has been researched less frequently or is an area requiring further research development (Kaur et al., 2022; Liao et al., 2018).

Some keywords appear in dim colors, such as *astechnology*, *digital literacy*, or *ethnoscience approach*, indicating that although the topic is starting to emerge in recent research, the number of studies is still limited. This indicates a significant opportunity for researchers to expand their studies related to the integration of digital technology into local wisdom-based modules, particularly in the development of e-modules, interactive multimedia, and digital platform-based learning relevant to the local cultural context. Meanwhile, keywords in bright yellow such as *local wisdom*, *education*, *value*, and *teaching materials* shows frequently emerging themes and the main focus of research in the last decade. As stated by Doyan et al. (2023) and Bahtiar et al. (2023), the color yellow indicates trending keywords frequently used by many researchers in developing modules, such as *science literacy*, *culture*, and *learning*.

In the context of local wisdom-based science learning, modules play a crucial role as teaching materials, enabling students to learn through phenomena, traditional practices, and cultural values relevant to their lives. Through local wisdom-based learning modules, students not only learn scientific concepts theoretically but also apply them in real-life situations relevant to their social and cultural environment. This type of learning provides meaningful experiences that encourage students to observe, analyze, question, and make evidence-based decisions—all key components of scientific literacy.

The integration of local wisdom into teaching modules also creates space for collaboration among students, as they frequently discuss cultural practices, local natural phenomena, and community customs related to science material. This interaction strengthens

scientific argumentation skills, fosters environmental awareness, and enhances critical and reflective thinking skills. Consistent with previous research, the use of local wisdom-based modules has been shown to improve conceptual understanding, strengthen science process skills, and foster an appreciation for regional culture (Safitri et al., 2024; Mulatsih et al., 2023; Suastra et al., 2021).

However, the implementation of local wisdom-based modules in science learning still faces several challenges. Some teachers still struggle to design modules that truly integrate local cultural values systematically. Furthermore, limited time and learning facilities also hinder the optimal development and implementation of local wisdom modules. Therefore, teacher training and support in the use of appropriate technology are needed to ensure effective module development.

Overall, local wisdom-based teaching modules have significant potential to improve science literacy by providing meaningful learning experiences, encouraging contextual problem-solving, and training students in processing information and constructing logical arguments in accordance with their culture. With the increasing development of research related to local wisdom modules, it is hoped that science education at various levels will become more relevant, adaptive, and sustainable.

Conclusion

The mapping results show that research on the development of local wisdom-based teaching modules to improve scientific literacy experienced a significant increase from 2016 to 2025, with publications predominantly in the form of scientific articles. The research focus shifted from integrating local cultural values to developing digital modules, e-modules, and ethnoscience approaches. Keywords such as *local wisdom*, *education*, and *science literacy* While digital literacy and technology remain under-explored, they represent opportunities for further research. Overall, local wisdom-based modules have proven effective in improving science literacy through contextual and meaningful learning, although their implementation still faces challenges such as teacher capacity and the availability of learning resources.

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Author Contributions

Riska Dia Sapitri conceived the study, designed the research framework, collected and analyzed the bibliometric data using Dimensions, Publish or Perish, and VOSviewer, interpreted the research findings, and drafted the full manuscript. The author also prepared all tables, figures, and visualizations, and finalized the article for publication. All components of the study—including conceptualization, methodology, investigation, interpretation, and manuscript preparation were carried out solely by the author.

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Conflicts of Interest

No conflict of interest

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