

Research Trends of Local Wisdom in Science Education: A Bibliometric Analysis Based on the Scopus Database

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Article Info	Abstract
Article history: Received: April 7, 2026 Accepted: May 26, 2026 Published: June 13, 2026 Keywords: Bibliometric local wisdom Science education Scopus VOSviewer This article is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License. © 2026 Journal of Mathematics, Science, and Computer Education	This study aims to map the research trends of local wisdom in science education through a bibliometric analysis based on Scopus data. The dataset was obtained from the Scopus export file analyzed in this study and includes 85 documents spanning the 2013–2025 period. Analyses were performed on the annual number of publications, the most productive affiliations, countries of origin, publication sources, the most influential authors based on citations, the most productive authors based on the number of documents, and keyword clusters. The results indicate that research on local wisdom in science education shows an upward trend, particularly after 2019, reaching temporary peaks in 2024 and 2025. Indonesia is highly dominant with 81 documents, while the most productive affiliation is Universitas Negeri Yogyakarta. The most prominent publication source is the Journal of Physics: Conference Series. Based on citations, Parmin is the most influential author with 66 citations, whereas Wilujeng, I. is the most productive author with 3 documents. Keyword mapping reveals that local wisdom serves as the core node connected to science education, science literacy, ethnoscience, sustainability, e-module, augmented reality, and PBL. The primary insight from these findings is that local wisdom is no longer merely positioned as a cultural context in science education; instead, it has evolved into a conceptual foundation for developing scientific literacy, pedagogical innovation, and learning that is relevant to the challenges of sustainable education. These findings confirm that research on local wisdom in science education is evolving from a contextual-cultural orientation toward strengthening scientific literacy, developing instructional materials, and creating innovative technology-based learning. The novelty of this study lies in its bibliometric mapping, which specifically integrates the dimensions of publication productivity, research actors, publication sources, citation impact, and keyword thematic structures into a single comprehensive landscape regarding Scopus-based local wisdom research in science education for the 2013–2026 period. This study contributes to identifying the

research landscape, key actors, and potential future research agendas within the field of local wisdom-based science education.

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INTRODUCTION

The integration of local wisdom into science education has received increasing attention in recent years as it is deemed capable of delivering learning that is more contextual, meaningful, and relevant to students' lives (Nihayati & Avrilianda, 2025). From the perspective of science education, local wisdom is not only interpreted as a cultural heritage that needs to be preserved, but also as a source of local knowledge that possesses connections to modern scientific concepts (Latip et al., 2024; Matindike & Ramdhany, 2025; Rasmawan et al., 2025). Therefore, integrating local wisdom into science learning has the potential to bridge scientific knowledge with students' socio-cultural realities, thereby making learning closer to their life experiences while simultaneously supporting the reinforcement of cultural identity and environmental awareness. In line with this, various studies demonstrate that local wisdom has been adopted across diverse science learning innovations, such as the development of modules, e-modules, learning models, inquiry approaches, and curriculum integration. The utilization of local wisdom in science education is reported to be capable of enhancing students' scientific literacy, strengthening critical thinking skills, developing scientific attitudes, and fostering a conservation character (Atmojo et al., 2025; Dewi, 2021; Mashami et al., 2025; Purwasih et al., 2025; Sakti et al., 2024a). These findings underscore that local wisdom-based science learning is not merely an alternative approach, but rather a pedagogical strategy with strong relevance to addressing 21st-century educational demands, which require a balance between conceptual mastery, character building, and ecological awareness (Benu & Supriatna, 2024; Elfira, 2025; Febriyanto et al., 2022; Nihayati & Avrilianda, 2025).

Nevertheless, the development of research on local wisdom within the context of science education exhibits increasingly complex dynamics. Prior studies have examined local wisdom-based learning in general; however, studies specifically mapping the progress of local wisdom research within science education remain relatively limited, particularly those based on publications indexed in Scopus (Arjaya et al., 2024; Lubis & Baiduri, 2025; Muhammad et al., 2022; Sutrimo et al., 2025a). This limitation results in a lack of a comprehensive overview regarding publication trends, major contributing actors, institutional and country networks, dominant publication sources, and emerging research themes in the field. Yet, such mapping is critical to demonstrate the positioning and direction of scholarly development while identifying remaining research gaps. In this context, bibliometric analysis becomes a relevant approach to provide a systematic overview of the development of a specific field of study. Bibliometrics allows researchers to examine publication productivity, citation patterns, co-authorship collaboration, institutional and country contributions, as well as the intellectual structure of a research topic through keyword analysis and network visualization (Putra & Wahyuni, 2025; Ramadhani & Zainil, 2025; Sari et al., 2026; Septina, 2025).

The Scopus database is frequently used in bibliometric studies due to its broad and standardized coverage of scientific literature, while VOSviewer software is widely utilized to map and visualize relationships between bibliometric elements, such as co-authorship, co-occurrence of keywords, and citation networks (Baas et al., 2020; van Eck & Waltman, 2010; van Eck & Waltman, 2014).

Previous studies have indicated that research on local wisdom in science education and learning has begun to be extensively mapped through bibliometric approaches, utilizing the Scopus database, VOSviewer, or other analytical tools. These studies have generally identified publication trends, collaboration patterns, keyword co-occurrences, and the direction of research themes. However, some of these studies still possess a relatively broad scope, focusing on education or local wisdom-based learning in general, are limited to specific timeframes, or have not integrated productivity indicators and thematic mapping specifically within the context of science education. Therefore, a bibliometric study focusing specifically on research trends of local wisdom in science education based on the Scopus database is still warranted. This study is essential to illustrate the progression of publications over time, identify dominant affiliations, countries, publication sources, and authors, and map the structure of keyword clusters representing the direction of research themes. By leveraging both instruments, the development of local wisdom research in science education can be captured in a more measurable and profound manner.

Based on the aforementioned rationale, there remains a need for a bibliometric study that specifically highlights research trends of local wisdom in science education based on the Scopus database. This need arises because prior studies possess several limitations. First, most previous studies have focused primarily on the implementation of local wisdom in learning, the development of instructional materials, or testing its impact on learning outcomes, scientific literacy, scientific attitudes, critical thinking skills, and student character. While these studies are important, they do not yet provide a comprehensive overview of the development of local wisdom in science education as a distinct research field. Second, available bibliometric studies tend to discuss ethnoscience, local wisdom, or science education within a broader scope, and have not specifically mapped local wisdom research within the precise context of science education. Third, prior research has rarely combined analyses of publication productivity, contributions of affiliations, countries, publication sources, dominant authors, and keyword co-occurrence mapping to comprehensively identify thematic structures and research directions (Donthu et al., 2021; Eck & Waltman, 2010; Hastuti et al., 2020; Ilhami et al., 2019; Khusniati et al., 2017; Moral-Muñoz et al., 2020; Parmin et al., 2016; Zupic & Čater, 2015).

Accordingly, the novelty of this study lies in its integrated bibliometric mapping that specifically analyzes research trends of local wisdom in science education based on the Scopus database. This study not only displays the trajectory of publication numbers over time but also identifies the most dominant affiliations, countries, publication sources, and authors in the field. Furthermore, this study utilizes VOSviewer-assisted keyword co-occurrence analysis to map thematic clusters, relationships between keywords, and future research directions. This novelty distinguishes the present study from previous ones by providing a more comprehensive overview of the development, intellectual structure, and future research opportunities within the domain of local wisdom-based science learning.

Consequently, this study aims to analyze research trends of local wisdom in science education through a bibliometric approach based on the Scopus database. Specifically, this research is directed toward answering three primary questions: (1) what is the trajectory of the annual number of publications; (2) who are the most dominant affiliations, countries, publication sources, and authors; and (3) what is the structure of the keyword clusters that represent the direction of research themes in the field of local wisdom within science education.

METHODS

This study employed a descriptive bibliometric design to map research trends of local wisdom in science education based on publications indexed in Scopus. In general, the

research procedures are conducted through several stages, namely determining the focus of the study, searching and selecting documents, cleaning and normalizing bibliometric data, descriptive analysis of metadata, mapping keyword co-occurrences, visualizing the bibliometric network, and interpreting the findings. These stages were implemented to ensure that the literature mapping process was conducted systematically, measurably, and in alignment with the research objectives. The data source consisted of a Scopus export file in CSV format provided by the user and analyzed on March 25, 2026.

The document search was conducted via the Scopus database using keywords tailored to the research focus, namely the integration of local wisdom in science/IPA education. The search query used was as follows: TITLE-ABS-KEY ("local wisdom" OR "local knowledge" OR "indigenous knowledge" OR "ethnoscience") AND TITLE-ABS-KEY ("science education" OR "science learning" OR "natural science learning" OR "IPA learning"). Inclusion criteria for this study comprised: (1) documents indexed in Scopus; (2) articles discussing local wisdom, local knowledge, indigenous knowledge, or ethnoscience within the context of science/IPA education; (3) documents possessing complete bibliometric metadata, such as author names, publication year, title, publication source, affiliation, country, citations, and keywords; and (4) documents within the publication year range of 2013–2026. Meanwhile, exclusion criteria included: (1) documents irrelevant to the context of science/IPA education; (2) duplicate documents; (3) documents with incomplete or unanalyzable metadata; and (4) publications that solely discussed local culture without any connection to science education.

Based on the selection results, the final dataset contained 85 documents within the 2013–2026 timeframe, with a total of 665 citations, averaging 7.82 citations per document. The units of analysis encompassed all available metadata, primarily publication year, authors, citation counts, affiliations, countries, publication sources, and author keywords. Analysis was carried out through several stages. First, data were exported from Scopus in CSV format, followed by an examination of completeness and consistency. Second, a data cleaning and normalization process was conducted, involving the removal of duplicate data, inspection of incomplete metadata, and standardization of variations in author names, affiliations, countries, and keywords. For instance, differences in the phrasing of affiliations or terms referring to the same entity were normalized to prevent them from being read as distinct entities during analysis. At this stage, keywords with identical meanings were also standardized, such as variations of the terms: local wisdom, local knowledge, and other terms relevant to the research context.

Third, a descriptive analysis was performed to calculate the distribution of the annual number of publications, citation counts, the most productive affiliations, primary publication sources, top authors, and contributing countries. In the country analysis, the number of unique countries appearing in the dataset was only eight. Thus, all were reported. Fourth, a keyword co-occurrence analysis was executed to identify relationships among research themes. Author keywords were normalized beforehand, and a keyword co-occurrence network was subsequently constructed with a minimum occurrence threshold of twice to ensure that only sufficiently representative terms were mapped.

The mapping and visualization of the bibliometric network were performed using VOSviewer software version 1.6.20. This software was utilized to generate keyword network visualizations, group keywords into thematic clusters, and illustrate relationships between terms based on their co-occurrence frequency. The clustering process followed the VOSviewer visualization approach, which aggregates keywords that frequently appear together into clusters representing specific research focuses or themes. The resulting clusters were then substantively interpreted to explain the direction of research development.

The bibliometric findings are presented in the form of tables, trend graphs, and keyword network maps. This article emphasizes descriptive and interpretative analysis. Thus, the obtained results are intended to map the research landscape rather than to test statistical hypotheses. The flow of the research procedure is visually depicted in Figure 1.

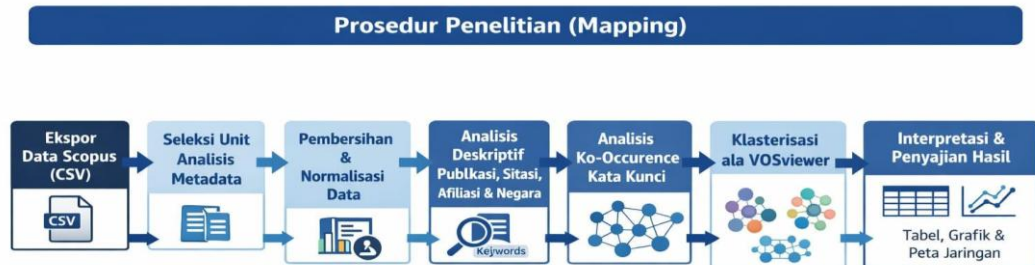


Figure 1 Research procedure

RESULTS AND DISCUSSION

Annual Publication Trends

In general, publications regarding local wisdom in science education demonstrate an upward trend, although it does not progress linearly. In the initial phase, the number of publications remained highly limited, with 1 document in 2013. After experiencing a decline during 2021–2022, the volume of publications increased again in 2023 with 11 documents and reached temporary peaks in 2024 and 2025 with 12 documents each. Meanwhile, publications for the year 2026 have only recorded 5 documents so far; hence, this figure cannot yet be interpreted as a decline since it does not represent a full publication year. This pattern indicates that local wisdom research in science education has experienced gradual development from a relatively constrained topic into a subject that is increasingly gaining academic attention, as seen in Figure 2.

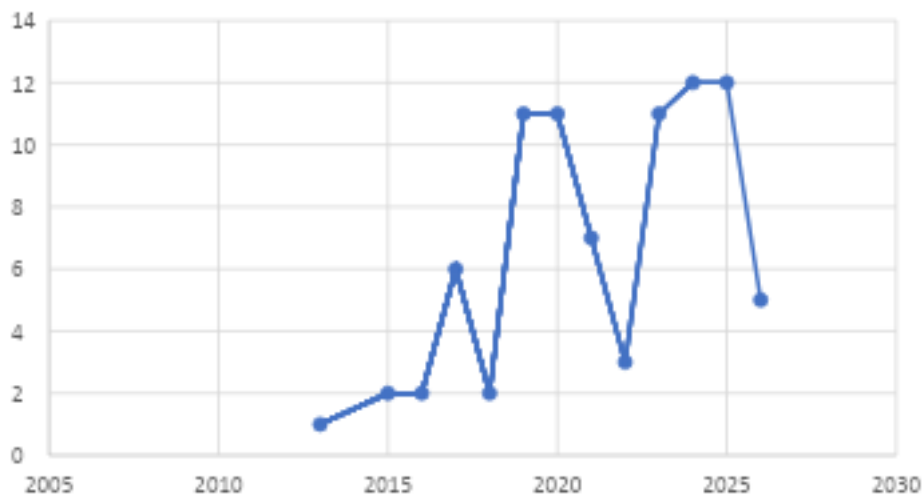


Figure 2 Trend of the annual number of publications on local wisdom in science education

Figure 2 shows that this increase in publications indicates that local wisdom is no longer positioned merely as supplementary cultural content, but is beginning to be understood as a pedagogical approach relevant to establishing science education that is contextual, meaningful, and close to students' lives. The findings in this study more specifically demonstrate that local wisdom is evolving as a pedagogical theme within science learning. Consequently, the focus of the study rests not only on the recognition of local knowledge

but also on how local wisdom is integrated into science learning strategies, media, models, and practices.

Structurally, the increase in publications can be associated with the strengthening orientation of educational policies and curricula that emphasize contextual learning, character reinforcement, scientific literacy, and the relevance of learning to students' socio-cultural environments. Furthermore, global factors such as the Sustainable Development Goals (SDGs) agenda, particularly those relating to quality education, sustainability, cultural preservation, and environmental awareness, have also driven the expansion of research linking science with local contexts. Therefore, the increasing publication trend during the 2023–2025 period demonstrates that local wisdom in science education has progressed from a local contextual issue into a research theme with broader relevance within science education discourse.

Most Productive Affiliations

Affiliation analysis reveals a strong dominance of Indonesian higher education institutions. Universitas Negeri Yogyakarta occupies the first position with 12 documents, followed by Universitas Negeri Surabaya with 10 documents. Furthermore, Universitas Pendidikan Ganesha and Universitas Sebelas Maret contributed 7 documents each. This pattern indicates that knowledge production on this topic is concentrated within teacher training institutions (LPTK) and universities with a strong foundation in science education. The dominance of Indonesian affiliations is logical given that local wisdom stems from a very rich diversity of local cultures that are close to the learning context in Indonesia. These findings also indicate that the development of local wisdom-based science education is largely driven by teacher education institutions and universities that possess a research agenda focused on contextual education. These findings can be observed in Figure 3.

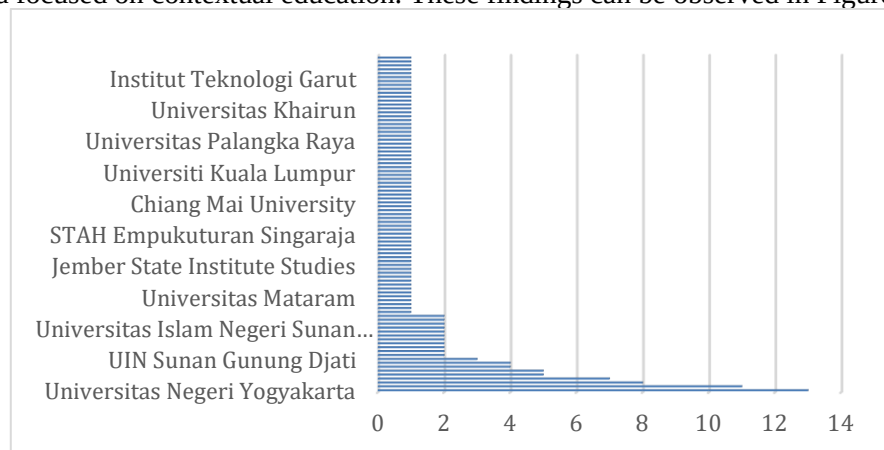


Figure 3 The most productive affiliations regarding local wisdom in science education per year

Figure 3 displays the author affiliation analysis, showing that publication productivity on the topic of local wisdom in science education is distributed across a number of institutions, albeit with an uneven level of contribution.

The dominance of educational institutions in Indonesia also confirms that the issue of local wisdom in science education is closely linked to the national socio-cultural context. This is logical because the concept of local wisdom is deeply rooted in the wealth of local culture, traditional practices, community knowledge, and ecological wisdom, which are widely utilized as learning resources in science education (Sutrimo et al., 2025b; Zidny et al., 2021). Thus, the high contribution of Indonesian institutions reflects an empirical and

epistemological proximity between the object of study and the social environment where the research is conducted. This means that Indonesia serves not only as a research location but also as the primary conceptual source in developing this theme.

Moreover, the dominance of universities with a strong foundation in the field of education indicates that local wisdom in science education is developed primarily within the frameworks of pedagogical innovation, instructional material development, ethnoscience, and contextual learning, rather than within pure science frameworks. This implies that the issue is positioned chiefly as a strategy to enhance learning relevance, scientific literacy, and students' connectedness to their surrounding culture and environment. In other words, local wisdom functions as a bridge between formal science concepts and the lived experiences of the community (Druker-Ibáñez & Cáceres-Jensen, 2022; Photo & McKnight, 2024; Rasmawan et al., 2025; Smith et al., 2022). Nevertheless, the still-concentrated distribution of affiliations indicates that this field retains substantial room for the expansion of inter-institutional collaboration. The low contribution from the majority of affiliations indicates that research development has not been uniform. Consequently, looking forward, it is necessary to strengthen research networks involving more universities, both nationally and internationally, so that the study of local wisdom in science education can develop more broadly, comparatively, and with a higher academic impact. Inter-institutional collaboration also has the potential to enrich methodological perspectives, expand the scope of local cultures investigated, and increase the global visibility of publications in this field.

Most Productive Countries

At the country level, publications on local wisdom in science education exhibit a highly concentrated pattern. Indonesia occupies the most dominant position with 81 documents, accounting for approximately 95.3% of the entire dataset. These data can be observed in Figure 4.

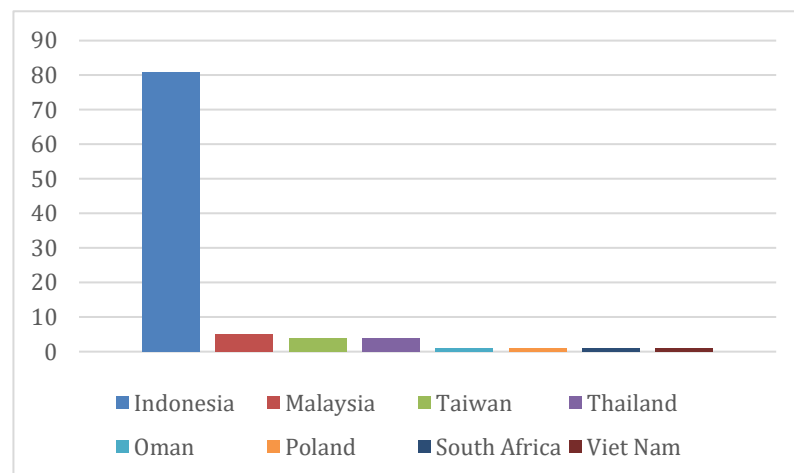


Figure 4 Most productive countries regarding local wisdom in science education per year

Figure 4 illustrates that Indonesia is the epicenter of research productivity regarding local wisdom in science education. This dominance can be understood through several primary factors. First, Indonesia possesses an exceptionally rich diversity of ethnicities, cultures, languages, traditions, and local knowledge, meaning that the concept of local wisdom has direct proximity to the socio-cultural context of national education. Second, in science education, local wisdom can be utilized as a contextual resource to explain natural phenomena, connect science concepts with students' experiences, and reinforce scientific

literacy relevant to daily life. Third, curriculum developments in Indonesia that emphasize contextual learning, character reinforcement, and the integration of cultural values have opened up avenues for the rise of research based on local wisdom and ethnoscience. Therefore, Indonesia's high contribution not only reflects a large volume of publications but also mirrors a strong academic and pedagogical necessity to connect school science with the cultural reality of the students (Mashami et al., 2025; Ramli et al., 2025; Sakti et al., 2024b).

Top Publication Sources

This distribution pattern of publication sources is visualized in Figure 5, which illustrates the dominance of conference proceedings alongside the emerging contribution of reputable science education journals.

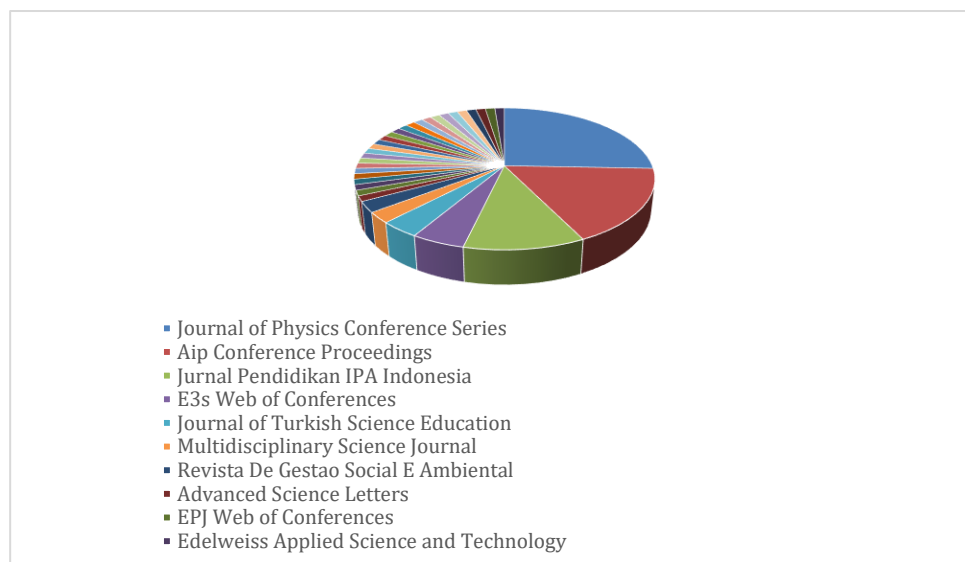


Figure 5 Top publication sources of local wisdom in science education per year

Publication sources indicate a tendency for this theme to be extensively published through conference proceedings and science education journals. The Journal of Physics: Conference Series ranks first with 21 documents, followed by AIP Conference Proceedings with 14 documents and Jurnal Pendidikan IPA Indonesia with 9 documents. These top three sources collectively accommodate approximately 51.8% of all documents. This composition demonstrates that research dissemination on local wisdom in science education is growing quite rapidly through conference forums while simultaneously establishing an initial foothold in reputable science education journals.

The dominance of conference proceedings can be understood because the theme of local wisdom in science education is still largely in an explorative and early development stage. At this stage, researchers tend to utilize conference forums as rapid dissemination spaces to report instructional innovations, media development, learning models, or the integration of local cultural contexts in science classrooms. This finding is consistent with the general nature of scholarly communication across various fields, where conference proceedings act as an initial medium to circulate ideas, expand academic networks, and introduce new research directions before they are developed into more mature journal articles (Singh et al., 2020).

Another study on trends of local wisdom in education also demonstrates that publications on this topic have increased in recent years and are dispersed across diverse educational contexts, indicating that the pattern of publication source fragmentation in this study is not an isolated phenomenon but rather part of a broader trend in culture-based research and science education (Rahmat et al., 2024).

Top Authors Based on Citations

When examined from the total number of citations, Parmin is the most influential author with 66 citations from 2 documents. This finding demonstrates that scholarly influence in this field is not necessarily determined by the quantity of documents but also by the positioning of key articles that serve as primary references in the development of local wisdom-based science education. Highly cited articles are generally associated with the development of modules, instructional tools, curricula, and the integration of local wisdom to strengthen scientific literacy. This tendency is also confirmed in Figure 6, which illustrates Parmin's dominance in total citations compared to other authors.

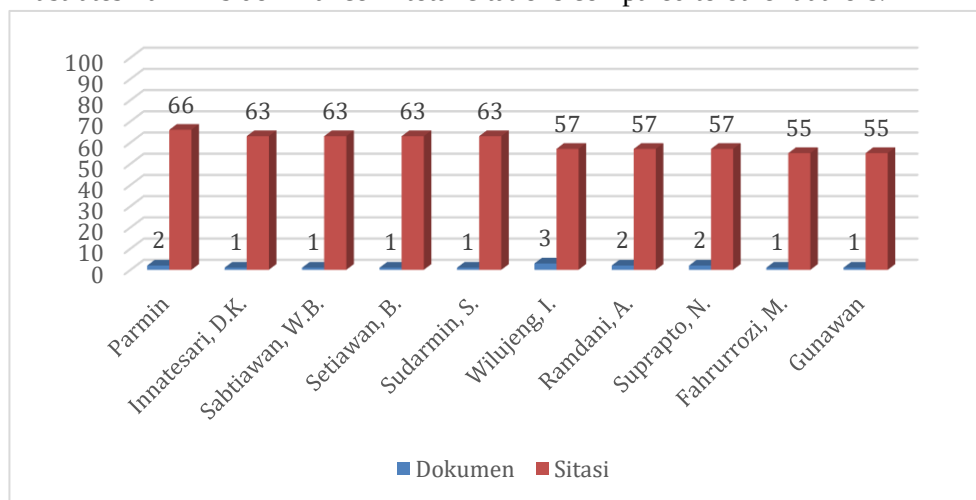


Figure 6 Top authors based on citations of local wisdom in science education per year

Figure 6 shows that scholarly influence in local wisdom research within science education is not evenly distributed but is instead concentrated among a small number of authors. The number of publications is not always linear with the number of citations obtained. In several cases, a single article is capable of generating a greater impactful force compared to multiple other articles published by the same or different authors. In general, this graph illustrates two primary patterns. First, there is a group of authors with low productivity but high citation impact, as observed in several authors with only one document whose citations exceed 60. Second, there are authors with relatively higher productivity, yet their accumulated citations are not proportionally larger. Accordingly, this map confirms that the dynamics of scholarly influence in the field of local wisdom within science education are determined more by the quality, relevance, and resonance of the work rather than merely the quantity of publications. Parmin's dominance in the number of citations indicates that his works occupy a central position in shaping the discourse of local wisdom in science education. The high number of citations for this author can be interpreted as a marker that his publications are frequently used as conceptual and methodological references by other researchers. In bibliometric studies, such a condition is commonly understood as evidence of academic authority or core references that play a role in directing the development of research themes.

Interestingly, several authors such as Innatesari, D.K.; Sabtiawan, W.B.; Setiawan, B.; and Sudarmin, S. obtained 63 citations from only a single document. This pattern indicates that within this field, there are high-impact articles, namely articles that, despite being solitary works, are capable of making major contributions to the development of the literature. This implies that works that are substantially strong—for instance, because they offer relevant local wisdom integration models, contextual learning innovations, or solid theoretical foundations—have a higher probability of becoming primary references compared to works that are more numerous but less prominent in terms of novelty or significance.

These results also carry methodological implications for the development of future research. New researchers in this field can utilize the most highly cited authors as entry points to trace seminal articles, conceptual developments, and the most influential scholarly networks. Furthermore, these results emphasize the importance of producing publications that do not merely increase the article count but also strengthen novelty, analytical sharpness, and practical relevance in order to achieve a broader citation reach. Overall, this graph confirms that the authorship structure in local wisdom research within science education displays a combination of productive authors and high-impact authors, with a tendency that academic influence is determined more by the strength of individual works than by publication quantity alone. Therefore, the development of this field appears to rely on a number of key works that serve as primary references in expanding the integration of local wisdom into science education.

Top Authors Based on the Number of Documents

Viewed from productivity, Wilujeng, I. is the most productive author with 3 documents. This is visualized in Figure 7.

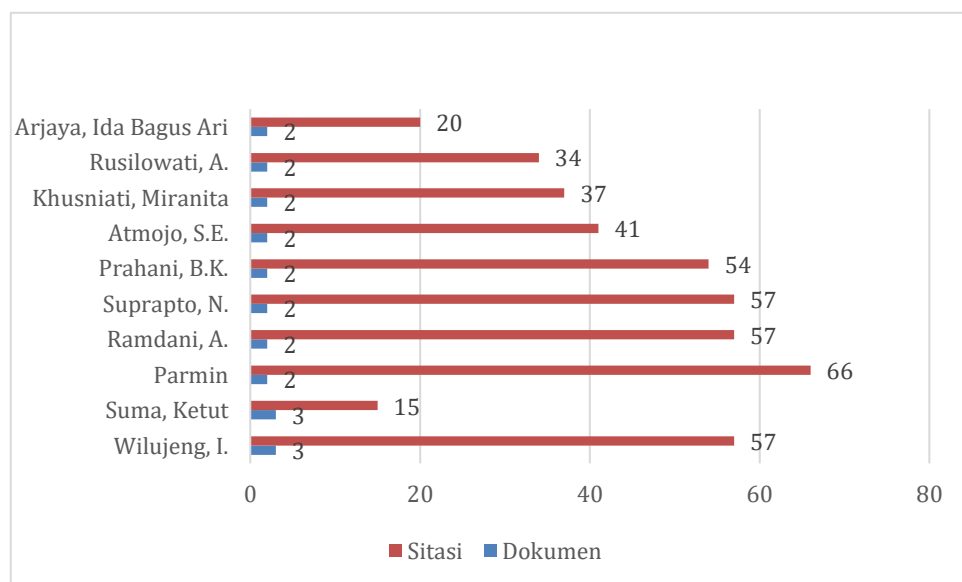


Figure 7 Top authors based on documents of local wisdom in science education per year

Figure 7 shows that author productivity is not always aligned with the level of citation impact. Based on the number of documents, Wilujeng, I. and Suma, Ketut are the most productive authors with 3 documents each. However, from the citation perspective, Parmin occupies the highest position with 66 citations, despite having only 2 documents. Authors

such as Parmin, Wilujeng, I., Ramdani, A., and Suprpto, N. can be viewed as important contributors who hold central positions in the knowledge network of local wisdom in science education. Articles capable of integrating local cultural values with applicable science pedagogical approaches appear to receive greater attention from the academic community (Adam et al., 2024). Therefore, the strength of this field lies not only in the growth of publication volume, but also in the ability of specific authors to produce works that become primary references for subsequent studies.

Keyword Clusters

Based on the VOSviewer mapping results, there were 315 keywords identified in the dataset, and as many as 49 keywords met the minimum occurrence threshold of twice to be visualized in the network. The most dominant keyword is local wisdom, which appears as the largest and most central node in the network. Additionally, keywords that also frequently appear and possess strong inter-topic connectedness are science learning, students, education computing, learning process, teaching materials, and research methods. Other keywords that are quite prominent are junior high schools, science education, critical thinking, qualitative approach, scientific literacy, and e-module. This co-occurrence network demonstrates that research on local wisdom in science education is not only centered on local cultural issues but is also connected to themes of science learning, students, instructional materials, scientific literacy, methodological approaches, and technology-based learning innovations. This is visually shown in Figure 8.

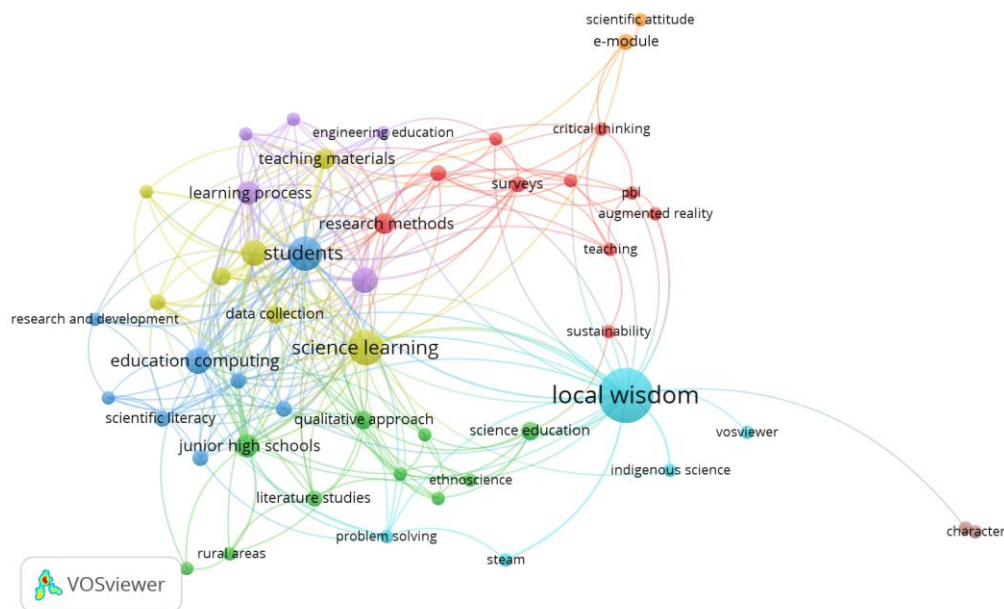


Figure 8 Keyword co-occurrence network map in research on local wisdom in science education

The visualization of the keyword network in Figure 8 shows that the theme of local wisdom occupies the most central position and has the largest node size compared to other keywords. This indicates that local wisdom is the core concept connecting various directions of research development in science education. The density of relationships between nodes also demonstrates that this study does not develop in isolation but instead forms several interrelated thematic clusters. Overall, the 49 keywords that met the

minimum occurrence threshold of twice are distributed into eight primary clusters, thereby illustrating the diversity of research focuses within the landscape of local wisdom studies in science education. Based on color mapping, each cluster represents a different research focus yet remains connected within a single research landscape (Lubis & Baiduri, 2025; Novia & Aznam, 2025).

The light blue cluster centers on the keyword "local wisdom," which is closely connected to science education, indigenous science, STEAM, problem-solving, VOSviewer, and character. This position indicates that local wisdom is not merely understood as local cultural content but has evolved into an integrative framework within science education. The connectedness with science education confirms that local wisdom is placed directly within the context of science pedagogy, whereas its link to indigenous science shows efforts to connect the local knowledge of communities with formal scientific knowledge constructions (Ogegbo & Ramnarain, 2024; Parmin et al., 2022).

The relationship with STEAM and problem-solving indicates that the integration of local wisdom is beginning to be directed toward 21st-century learning approaches, which no longer simply emphasize cultural preservation but also contextual problem-solving. Meanwhile, the connection with character shows that local wisdom is also positioned as a medium for shaping the values, attitudes, and identities of students. Thus, this cluster can be understood as a representation of conceptual and philosophical dimensions, namely local wisdom as a foundation for developing science education that is contextual, humanistic, and relevant to community needs (Pinneo & Benton, 2024).

The green cluster includes the keywords science learning, science education, ethnoscience, qualitative approach, literature studies, junior high schools, and rural areas. This cluster shows that the majority of research operates within the realm of learning implementation, particularly in the context of junior high schools and regions that have close proximity to local cultural practices. The presence of ethnoscience becomes highly important because it demonstrates that local wisdom in science education is extensively developed through an ethnoscience approach, which turns local practices, beliefs, and knowledge into resources for explaining science concepts (Jufrida et al., 2024; Pratama et al., 2023).

The keywords "qualitative approach" and "literature studies" indicate that research within this cluster is not only experimental in nature but is also widely conducted through qualitative studies and literature reviews to comprehend the meaning, context, and relevance of local culture in learning (Kasi et al., 2021). Moreover, the relationship with junior high schools shows that the lower secondary educational level is a quite dominant context in the implementation of local wisdom. This can be interpreted as meaning that during this phase, students are considered to be at a strategic stage to develop scientific understanding as well as cultural identity (Arti & Widowati, 2025; Prastika et al., 2021). Generally, the green cluster represents local wisdom as a science learning strategy that is contextual and based on the socio-cultural reality of the students.

The yellow cluster centers on students, science learning, the learning process, and data collection. The dominance of the keyword "students" with a relatively large node size demonstrates that research on local wisdom in science education is highly oriented toward students as the primary subjects of instructional innovation. The strong relationship between students and science learning reinforces that the utilization of local wisdom is directed toward enhancing the quality of learning experiences, conceptual understanding, and student engagement within the science learning process (Lawi et al., 2022; Prodjosantoso, 2022; Saputra, 2020).

The presence of a learning process indicates that the research focus is not only on final outcomes but also on the dynamics of the learning process itself, including how students

construct meaning when science concepts are brought together with local cultural experiences (Rahmatih et al., 2020). Meanwhile, data collection implies fairly strong methodological attention in these studies, particularly in efforts to record students' responses, perceptions, or learning achievements (Febrian & Jumadi, 2022). This cluster illustrates that local wisdom is extensively studied as an approach capable of making science education closer to students' lives, thereby increasing the relevance and meaningfulness of learning (Maulida & Sunarti, 2022).

The purple cluster contains the keywords "teaching materials," "learning process," and "engineering education." This cluster shows that the development of instructional materials is one of the mainstream directions in local wisdom research. The appearance of the keyword "teaching materials" signifies that local wisdom is frequently translated into learning products such as modules, media, worksheets, or other lesson devices (Nonggi et al., 2021). In other words, local wisdom does not stop at the conceptual stage but is concretized into learning resources that can be directly used in the classroom (Ni'mah & Noor, 2023).

Interestingly, the emergence of engineering education indicates that the issue of local wisdom has also begun to intersect with other disciplines outside of pure science education. This can be interpreted as an expansion of scope, where local values and contexts are used not only to teach science but also to support interdisciplinary approaches and more applicable learning designs (Kamila et al., 2024). This cluster confirms that the development of learning packages serves as an important bridge between local wisdom ideas and instructional practices.

The red cluster consists of research methods, surveys, critical thinking, PBL, augmented reality, and teaching. This cluster shows that local wisdom research does not merely focus on the integration of local culture but has also begun to intersect with modern pedagogical innovations and the reinforcement of 21st-century skills. The connectedness with critical thinking indicates that local wisdom is viewed as having the potential to enhance higher-order thinking skills when integrated into science learning (Astawan et al., 2025).

The appearance of PBL (Problem-Based Learning) shows that local wisdom is frequently combined with problem-based learning models, particularly to present real-world problems that are close to the lives of local communities. Meanwhile, the relationship with augmented reality illustrates the emergence of a new trend, namely the utilization of digital technology to package local wisdom content in a more attractive and interactive manner (Isro'ullaili et al., 2024). The keywords "surveys" and "research methods" also indicate that this field is developing with the support of increasingly diverse evaluation instruments and research designs (Nabilah et al., 2025). Overall, the red cluster represents a research shift from mere local content integration toward the development of innovative learning models capable of measuring their impact more systematically.

The orange cluster contains the keywords e-module and scientific attitude. Although the number of nodes in this cluster is relatively fewer, its position is quite important as it shows a more specific focus on affective outcomes and digital media development. The relationship between e-modules and scientific attitude signifies that local wisdom is increasingly packaged in the form of electronic modules to support more flexible learning while simultaneously fostering students' scientific attitudes (Asmayawati & Yetti, 2024). This cluster can be read as an indication that research development is beginning to steer toward the integration of local cultural substance, instructional technology, and the formation of scientific dispositions. Accordingly, local wisdom is viewed not only as a source of learning context but also as a means to construct scientific attitudes aligned with cultural values and the environment.

This map, when viewed as a whole, shows that all clusters form a relatively dense network structure with local wisdom as the primary connecting node. The light blue cluster acts as the conceptual center linking local wisdom with science education, local knowledge, character, and problem-solving orientations. From this center, relationships flow to the green and yellow clusters, which mark the implementation of local wisdom-based science learning within the context of students, the learning process, ethnoscience, and schools (Ijatuyi et al., 2025). Next, the purple cluster shows how these ideas are translated into instructional materials and lesson devices, whereas the red and orange clusters exhibit more contemporary developmental phases through pedagogical innovations, digital technology, critical thinking skills, and scientific attitudes. This relationship pattern reveals that local wisdom research in science education is developing from three large axes. First, the conceptual-cultural axis, namely local wisdom as an epistemological and value foundation in science education. Second, the pedagogical-implementation axis, namely the application of local wisdom in the learning process, instructional materials, and school contexts. Third, the innovative-transformative axis, namely the integration of local wisdom with modern learning models, technology, and the reinforcement of 21st-century competencies. Thus, this research landscape shows that local wisdom has shifted from a local contextual theme into a strategic framework supporting future-oriented, adaptive, and more meaningful science learning transformations (Ledang et al., 2024).

Implications of Findings

Bibliometric findings show that the most highly cited articles in the dataset exhibit a relatively uniform thematic tendency, which is positioning local wisdom as the foundation for developing science instructional materials and learning tools. This pattern indicates that during the early to intermediate developmental phases, local wisdom research in science education was directed more toward practical-pedagogical needs, specifically to generate learning innovations that are contextual and relevant to the students' socio-cultural environment. The dominance of this theme is reflected in the works of (Dwianto et al., 2017; Ramdani et al., 2021; Setiawan et al., 2017), which collectively assert that the integration of local wisdom into learning tools and instructional materials contributes to the enhancement of scientific literacy, thinking skills, and scientific attitudes.

Substantively, the high citation count of these articles can be interpreted as evidence that the academic community pays significant attention to learning approaches capable of bridging modern scientific knowledge with local cultural contexts. From the perspective of science education, the integration of local wisdom functions not only as a strategy for material contextualization but also as an epistemological medium to bring science closer to the lived experiences of students. Therefore, local wisdom in these studies is not positioned as a complementary element, but rather as a learning resource that possesses both pedagogical and cultural value simultaneously.

Theoretically, this finding has implications for strengthening the position of local wisdom as a conceptual framework in context-based science learning. Local wisdom is no longer understood merely as cultural content inserted into teaching materials but as an epistemological basis that can enrich how students comprehend science concepts through experiences, social practices, and local knowledge. This theoretical implication indicates that local wisdom-based science education has the potential to expand the science education paradigm from an approach solely oriented toward concept transfer to one that is more contextual, cultural, and transformative. Thus, the results of this study provide a foundation for developing science learning theories that are more responsive to the cultural diversity and learning environments of students.

On the other hand, the emergence of the article by [Suprpto et al., \(2021\)](#) indicates an expansion of the study's orientation, moving from the mere development of learning tools toward a more macro reading of local wisdom's position within curriculum reform. This shift is important because it marks that the discourse of local wisdom-based science learning is beginning to move from the implementation realm into the structural and educational policy realms. This means that local wisdom is no longer understood only as content integrated into learning but also as an approach that has the potential to influence the direction of curriculum development, the goals of science education, and learning paradigms that are more responsive to the diversity of local contexts.

Practically, this finding provides implications for teachers, lecturers, researchers, and learning tool developers to design science learning that is closer to students' lives. Teachers can utilize cultural practices, local phenomena, environmental wisdom, or community knowledge as starting points to explain science concepts. For instructional material developers, these results confirm the importance of compiling modules, e-modules, worksheets, assessments, and learning media that do not only contain scientific concepts but also link them with the socio-cultural experiences of the students. Another practical implication is the necessity for learning that does not stop at the introduction of local culture but is instead directed toward developing scientific literacy, critical thinking abilities, and scientific attitudes, as well as concern for the environment and cultural sustainability.

Furthermore, the study by [Muhammad et al., \(2022\)](#) demonstrates that research on local wisdom-based learning has entered a reflective and meta-analytical stage, which is indicated through the use of a bibliometric approach to map the field's development. The presence of such studies shows that the field of local wisdom studies in education has developed maturely enough to begin producing trend mappings, thematic clusters, and opportunities for specialization within specific educational disciplines. In this context, bibliometrics functions not only to describe publication growth but also to identify shifts in research focus, intellectual networks, and future directions of scholarly development.

Policy-wise, the results of this study indicate the importance of institutional and curricular support toward the integration of local wisdom into science education. Governments, curriculum developers, and educational institutions need to provide more explicit space for utilizing local contexts in curriculum design, instructional materials, and learning assessments in science. This integration can be directed to reinforce education that is not solely oriented toward academic achievement, but also toward cultural preservation, the strengthening of local identity, and sustainable development. Therefore, local wisdom-based science learning has the potential to become one of the relevant science education policy strategies to answer 21st-century learning needs, particularly within the context of societies possessing cultural and environmental diversity.

Based on the entirety of these findings, it can be understood that the research map of local wisdom in science education is experiencing gradual development. In the early stages, the research focus was concentrated on developing teaching materials, modules, and learning tools aimed at improving learning outcomes and scientific competencies. However, in subsequent stages, this study began to evolve toward a more strategic direction, touching upon issues of curriculum reform, educational innovation, and the mapping of knowledge structures within the field. This development indicates that local wisdom-based science learning is no longer just an applied topic of local nature but has instead become an academic discourse possessing theoretical, pedagogical, and policy relevance.

The novelty of this study lies in its bibliometric mapping that specifically highlights the development of local wisdom research in science education based on articles indexed in the Scopus database. Distinct from prior research, which generally focused on developing

learning tools or applying local wisdom within specific classroom contexts, this study provides a more comprehensive overview regarding the trajectory of publication growth, influential articles, and dominant thematic focuses, as well as shifts in study orientation from practical-pedagogical realms toward theoretical, curricular, and policy realms. Thus, the novelty of this research lies not only in the object of study but also in its contribution to identifying the position, development patterns, and research opportunities of local wisdom-based science learning more systematically.

This trend confirms that research on local wisdom in science education possesses great potential to continue developing, particularly if directed toward integration across levels, starting from learning designs, assessments, and curriculum development to science education policies oriented toward cultural sustainability and local contexts. Accordingly, the results of this bibliometric study do not merely capture dominant thematic tendencies but also display the transformation of the study field from context-based learning practices toward a framework for developing science education that is more systemic and academically competitive.

CONCLUSION

Bibliometric analysis of 85 Scopus documents indicates that research on local wisdom in science education has experienced clear growth, particularly since 2019. The research landscape is heavily dominated by Indonesia, from both the country and contributing affiliation perspectives. Universitas Negeri Yogyakarta and Universitas Negeri Surabaya serve as the primary hubs of contribution, while the Journal of Physics: Conference Series, AIP Conference Proceedings, and Jurnal Pendidikan IPA Indonesia represent the most dominant publication sources. Parmin is recorded as the most influential author based on citations, whereas Wilujeng, I. is the most productive author. The keyword map exhibits three primary orientations: (1) local wisdom as a conceptual foundation for contextual science learning; (2) the development of instructional tools, models, and technologies; and (3) the reinforcement of scientific literacy and character. The novelty of this study lies in the presentation of a bibliometric mapping that specifically places local wisdom in science education as a research field that is not only growing quantitatively but is also forming a clear thematic direction regarding local culture integration, learning innovation, scientific literacy, and character education. The results provide a conceptual contribution by demonstrating that local wisdom has shifted from a mere supporting cultural context into a relevant pedagogical framework for the development of contextual and sustainable science education. These results indicate that future research agendas need to be directed toward international collaboration, increasing publications in reputable journals, strengthening instructional experimental designs, and expanding the integration of local wisdom with issues of sustainability, digital learning, and socio-scientific issues. This study is limited to a single database, namely Scopus. Thus, subsequent research is suggested to combine Web of Science, Dimensions, or Google Scholar to make the research landscape more comprehensive. Accordingly, this study confirms that strengthening local wisdom research in science education is not only important to enrich bibliometric studies but is also strategic in establishing science learning that is more contextual, inclusive, and responsive to the needs of 21st-century education.

CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

AUTHOR CONTRIBUTIONS STATEMENT

MM has contributed to the conceptualization section and is the corresponding author. MM and NIP have contributed to methodology, project administration, and original draft preparation. SH, MH, QQ, IL, and EO have contributed to data curation, formal analysis, and editing.

AI DISCLOSURE STATEMENT

The authors used Grammarly during the preparation of this work to check and correct the grammar used in this article. After using the tool/service, the authors thoroughly reviewed and edited the content as needed and take full responsibility for the publication's content. The authors declare that this research was prepared, researched, written, and edited without the aid of artificial intelligence (AI) techniques.

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