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Page 1482-1497

Exploring the Potential of Local Wisdom as a Scientific Bridge: A Systematic Literature Review in the Educational Context

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ABSTRACT

Local wisdom has great potential as a rich and multidisciplinary learning resource. The development of technology has led the world of education to focus on involving digital devices and forgetting local wisdom that is actually inherent in everyday life. This study aims to identify the extent of local wisdom involvement in learning through a Systematic Literature Review (SLR). Article searches were conducted on the Scopus database (2017-2024). From the initial 236 documents, 40 articles were selected for analysis using Vos Viewer and Parsif.al software. The results of the analysis showed that research on local wisdom in learning covered a wide range of disciplines, education levels, and learner competencies. Four main groups were identified: demographic, cultural, educational, and thematic analysis aspects. Local wisdom is relevant in social sciences, humanities, medicine, engineering, agriculture, computer science, and earth and planetary sciences. Most research was conducted at universities (32%), mostly using qualitative methods (51%). Publication trends show an increase in interest from 2018 to 2023, with the United States and the United Kingdom dominating the field. SLR reinforces the potential of local wisdom as a learning resource that can enhance conceptual understanding, motivation, critical thinking, character development, and preservation of cultural heritage. However, further research is needed to determine effective integration strategies, teaching materials, and long-term impacts, especially for higher education that produces prospective primary school teachers. This study contributes to understanding the current state and potential of local wisdom integration in education across different disciplines and levels. The study provides valuable insights for educators, researchers and policy makers to utilize local wisdom as a multidisciplinary learning resource and identify future areas of research and development.

INTRODUCTION

Local wisdom-based learning is one of the efforts to maintain and preserve local cultural values amid the rapid development of technology and globalization. According to research conducted by (Azizah & Astuti, 2020), local wisdom has an important role in learning because it is closely related to the community's physical (natural) and socio-cultural environment. This environment has various potentials that can be explored and developed as a supplement to teaching and learning materials in schools. However, there is limited research on the involvement of local wisdom in classroom learning, from early childhood to higher education. This lack of information needs to be addressed by researchers. Therefore, the researcher conducted a Systematic Literature Review (SLR), which aims to analyze previous research that has been done on the involvement of local wisdom in classroom learning. With this analysis, it is hoped that a complete and

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IJORER, Vol. 6, No. 5, September 2025
Page 1482-1497

comprehensive picture of the involvement of local wisdom in classroom learning, especially at the tertiary level, can be obtained.

The educational process that only focuses on mastering students' scientific aspects and intelligence can lead to reduced character-building and cultural values in students. According to (Asrizal et al., 2018), the education process must develop students' competencies in knowledge, skills, attitudes, and superior values to deal with increasingly rapid technological advances. Local wisdom-based learning is a solution to overcome the shift of cultural values in students. Local wisdom is everything that characterizes a region, whether in food, customs, dances, songs, or regional ceremonies. Local wisdom contains concepts in a subject matter taught by teachers to students. By involving local wisdom in the learning process, students will more easily understand the subject matter because it is close to their daily environment.

Research conducted by Naurah Nazifah & Syamina, (2021)shows that teaching materials integrated with local wisdom are effective at the junior and senior high school levels. These teaching materials have a very high effect on student learning outcomes, especially in science subjects. Local wisdom is also effectively developed into teaching materials that support student learning achievement. This shows that the involvement of local wisdom in learning can significantly improve student learning outcomes.

In science learning, the involvement of local wisdom also has an important role. According to Laos & Tefu (2019), science learning will be meaningful in people's lives if teachers are skilled in designing, developing, and managing learning systems to create an effective learning atmosphere. Islam et al., (2023), stated that science learning can be integrated with material content based on local wisdom. Fauzi et al., (2022), added that if science learning in schools does not maintain the culture or local wisdom of students, then the consequences are that students will reject or only partially accept the science concepts they learn. Learning about local culture or everyday wisdom will provide students with meaningful and interesting learning.

Ethnoscience is one of the approaches that can be used in local wisdom-based learning. Risdianto et al., (2021), stated that ethnoscience is an activity of transforming the original science of the community with science as an understanding of nature and culture that develops in the community. The original science of the community is reflected in local wisdom as an understanding of nature and culture that develops in the community. A weak understanding of student ethnoscience can affect concern for a local cultural plurality (Susilawati et al., 2018). Lestari et al., (2021), added that ethnoscience can be integrated into learning at school with various learning themes. Zidny et al., (2022), mentioned several things that can be raised in ethnoscience-based learning, namely the historical thinking of the community in organizing nature, special terms from each community group, holistic reasoning in various science and technology sectors, and the idea of dynamic concepts.

The development of local wisdom-based teaching materials is possible for a teacher because it is also attached to his duties as a facilitator in the classroom. Astri et al., (2022), stated that teaching materials are learning resources intentionally developed

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IJORER, Vol. 6, No. 5, September 2025
Page 1482-1497

to achieve learning objectives. With the existence of local wisdom-based education, it is hoped that all students in a certain area can understand science and apply the learning gained from school in everyday life. However, based on the existing reality, not many schools at all levels of education involve local wisdom as teaching material. Nazifah & Syamina, (2021), stated that teachers need teaching materials that are suitable for the environment where students live, but the student books available by the Government have a very broad scope and are not specific to the environment around each region. The low ability of students to find the relationship between the science concepts learned and the reality in the surrounding environment is due to the lack of supporting teaching materials.

As prospective elementary school teachers, prospective undergraduate students at the elementary school teacher education (PGSD) study program must be able to see carefully and mix local wisdom in the surrounding environment into teaching materials that can be used in the learning process in the classroom. Therefore, this study aims to obtain a strong foundation for further research on developing science teaching materials based on local wisdom for prospective elementary school teachers. This research is expected to contribute significantly to efforts to preserve local wisdom through learning in schools.

Science learning is important in building the foundation of scientific understanding, especially at an early age. According to a study by Tai et al., (2006), exposure to science concepts at an early age is positively correlated with children's interest in science in the future. In addition, science learning that involves experimentation can improve critical thinking and problem-solving skills. Science learning also promotes science literacy, an individual's ability to engage with science-related issues and scientific ideas (EOCD, 2023). Although in the latest curriculum applicable at the primary education level in Indonesia, the name of the science subject has been merged with the social studies subject to become IPAS (Natural and Social Sciences), science content is still considered very important to learn in primary schools. IPAS aims to provide a more holistic and contextualized learning experience for primary school students, including exploring the wealth of local wisdom related to IPAS and using it in solving problems.

However, the view of science often contradicts local wisdom. This is due to the teacher's lack of ability to present science learning that does not answer questions in students' minds or phenomena that have not been answered scientifically. As a result, science functions less meaningfully for students and feels unimportant.

Science literacy, an individual's ability to engage with issues related to science and scientific ideas (EOCD, 2023), is needed to understand and apply science knowledge in the context of local culture and environment (local wisdom). By integrating science literacy and local wisdom, individuals can develop a holistic understanding of science and technology in their cultural context. This can help identify relevant and sustainable solutions to science and technology challenges faced in society and promote respect for traditional and local knowledge in the development of modern science (Liu et al., 2023).

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IJORER, Vol. 6, No. 5, September 2025
Page 1482-1497

The involvement of local wisdom in learning is still practiced by developed countries such as France and Finland, which are known to be advanced in education. According to Maijala (2020), the use of culture can support foreign language teaching, where a good knowledge of culture can give confidence to prospective foreign language teachers and help them prepare for the uncertainty of teaching culture. In the United States, cultural engagement is also found in several studies. Kim et al., (2018), stated that animations derived from Korean local wisdom (Korean folktales) had a positive impact on students, where students found it helpful in understanding and exploring traditional cultural values such as kindness, honesty, and loyalty to parents. Students involved in the discussion also showed a good understanding and interpretation of the moral lessons. In addition, Henward et al., (2019), found that local culture can influence policy-making regarding research-based curriculum and local culture in the United States.

Although local wisdom engagement is becoming popular, its use in the classroom is still limited. Therefore, the researcher will conduct a systematic literature review (SLR) that aims to identify the extent of the involvement of local wisdom in learning in classrooms. This research is expected to provide recommendations for the involvement of local wisdom in science learning in elementary schools and institutions that educate prospective elementary school teachers in Indonesia. These recommendations will help prospective elementary school teachers in identifying local wisdom to be used as learning materials, identifying misconceptions, and reducing them so that the science literacy of elementary school students increases. This research will look for research trends involving local wisdom in learning, including the types of research used, education levels, subjects, and learner competencies that are often the focus of learning. The research question (RQ) in this systematic literature review is as follows:

RQ1: What areas of research often focus on local wisdom in learning?
RQ2: What levels of education involve local wisdom in learning?
RQ3: What learner competencies are often developed using local wisdom?
RQ4: What types of research often involve local wisdom?

By answering these questions through analysis of articles published in Scopus-indexed international journals, this study is expected to provide a comprehensive picture of the involvement of local wisdom in classroom learning, as well as provide useful recommendations for educators, especially prospective elementary school teachers, in integrating local wisdom in science learning to improve students' science literacy.

RESEARCH METHOD

This research uses the Systematic Literature Review (SLR) method to examine the scope of involving local wisdom in learning. SLR is a method used to identify, evaluate, and interpr*et al*l relevant research related to a particular research question, topic, or phenomenon of interest (Kitchenham & Brereton, 2013). This method was chosen because it can provide a comprehensive and objective overview of the state-of-the-art of the topic under study, as well as identify existing research gaps (Petticrew & Roberts, 2008) . The

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IJORER, Vol. 6, No. 5, September 2025
Page 1482-1497

systematic review in this study was conducted by adopting the *PRISMA* ***(**Preferred Items for Systematic Reviews and Meta-Analyses)* design, which consists of four steps, namely identification, screening, eligibility, and inclusion (Wiyanto et al., 2020). The PRISMA design was chosen because it is a widely accepted guideline for conducting SLR, with clear and structured steps to ensure transparency, repeatability, and minimization of bias in the review process (Moher et al., 2009).

Article searches were conducted through the Scopus database, which is the largest database of abstracts and citations of peer-reviewed literature (Burnham, 2006). The keywords used in the search were "local wisdom" OR "local wisdom learning" (TITLE-ABS-KEY (local AND wisdom AND lesson) OR TITLE-ABS-KEY (traditional AND lesson AND study) AND TITLE-ABS-KEY (cultural AND lesson)). The publication period of the articles searched was between 2017 and 2024, with the consideration of getting the latest research related to the topic studied. The use of the Boolean operator "OR" in the keywords aims to expand the scope of the search and ensure all relevant articles can be identified (Bramer et al., 2018).

The initial Scopus database search yielded 236 articles using predetermined keywords. A filtering process eliminated 18 articles: 1 duplicate, 6 off-topic, 5 in other categories, and 6 due to certain notes. The remaining 219 articles underwent further screening for eligibility based on relevance, methodological quality, and available information (Okoli, 2015). This screening produced 70 eligible articles for in-depth analysis.

Using Parsif. al software, a collaborative tool for systematic literature reviews, the 70 articles were analyzed. Parsif. al facilitates article grouping, data extraction, and synthesis. However, 30 articles were excluded due to inaccessibility, leaving 40 for further analysis to address the research questions. Data analysis involves extracting key information, such as research objectives, methods, findings, and relevant conclusions (Brereton et al., 2007). A narrative synthesis was chosen to integrate results from various study types (quantitative, qualitative, and mixed-methods) and identify patterns, trends, and research gaps in local wisdom engagement in learning. The synthesis results will be presented descriptively with supporting tables, graphs, or diagrams.

Quality assurance measures were implemented to maintain the review's reliability. Two researchers independently conducted the search, screening, and data extraction, resolving differences through discussion and consensus (Brereton et al., 2007). An expert panel documented and reviewed the review protocol for methodological robustness (Kitchenham & Brereton, 2013). The included articles' reference lists were manually checked for additional relevant studies (Wohlin, 2014), increasing the review's transparency, repeatability, and validity.

This rigorous and systematic approach aims to provide a comprehensive understanding of the state of the art of local wisdom engagement in learning and identify opportunities and directions for further research on this topic.

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IJORER, Vol. 6, No. 5, September 2025
Page 1482-1497

RESULTS AND DISCUSSION

Results

VosViewer analysis of 236 local wisdom in learning documents revealed four main research clusters (Figure 1). The first cluster emphasizes adult, male, female, language, and controlled study (28 branches, strength 84, occurrences 17). The second cluster focuses on culture, traditional knowledge, conservation, religion, and cultural heritage (20 branches, strength 24, occurrences 11). The third cluster includes narrative, education, child, and curriculum (19 branches, strength 27, occurrences 11). The fourth cluster consists of thematic analysis, leadership, teaching, student, and decision-making (22 branches, strength 43, occurrences 8). These clusters highlight diverse topics and focus on local wisdom research (Tan et al., 2010).

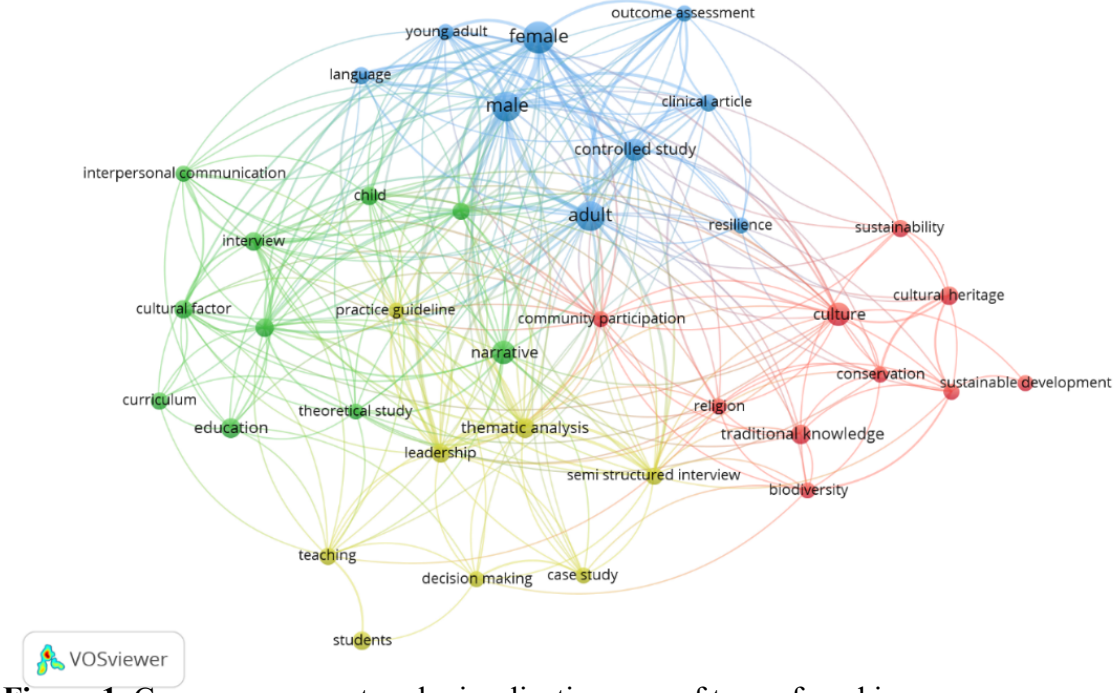

Figure 1. Co-occurrence network visualization map of terms found in co-occurrence and keywords

The VosViewer overlay visualization map (Figure 1) shows that the most recent research on the local wisdom theme is related to traditional knowledge, clinical articles, outcome assessment, and students. In terms of topic density, adult, male, and female studies are the most frequently conducted. On the other hand, the themes of education, curriculum, teaching, and students are still sparse, indicating that there are opportunities for further research development on local wisdom in the context of education and learning.

Scopus database analysis of 236 local wisdom in learning documents shows dominance in the fields of social, science, arts and humanities, and environment (Figure 2). Interestingly, local wisdom is also related to various disciplines such as medicine,

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IJORER, Vol. 6, No. 5, September 2025
Page 1482-1497

engineering, agriculture, computer science, and earth and planet, which shows that the exploration of local wisdom remains relevant and is carried out in various fields of science, not just contrary to science (Burnham, 2006). This finding is in line with Dewi et al., (2019) statement that local wisdom can be a bridge between traditional knowledge and modern scientific knowledge.

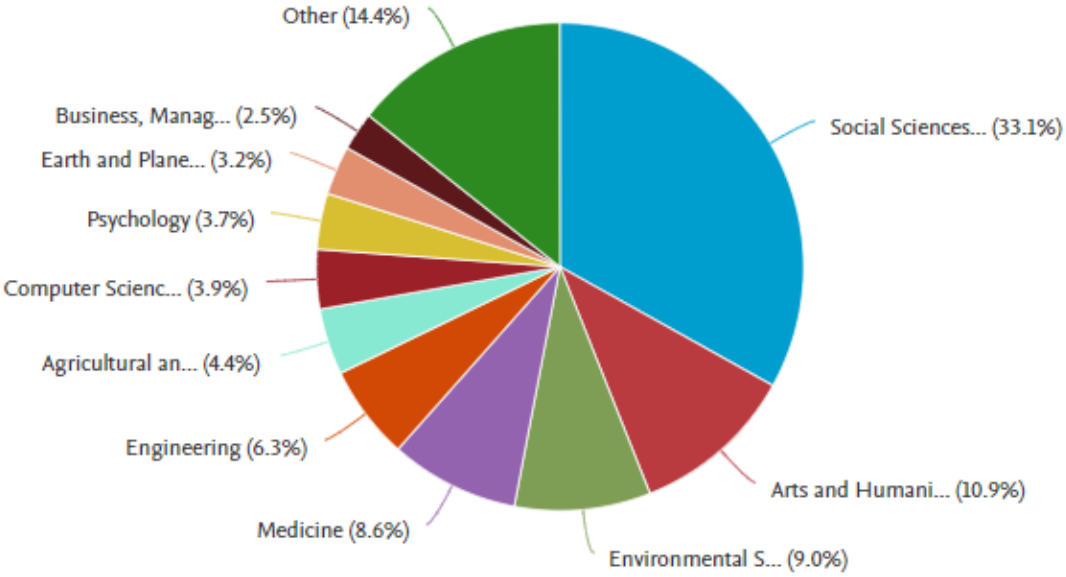

Figure 2. Disciplinary study of Local Wisdom in Learning.
Source: Scopus Database, 2024

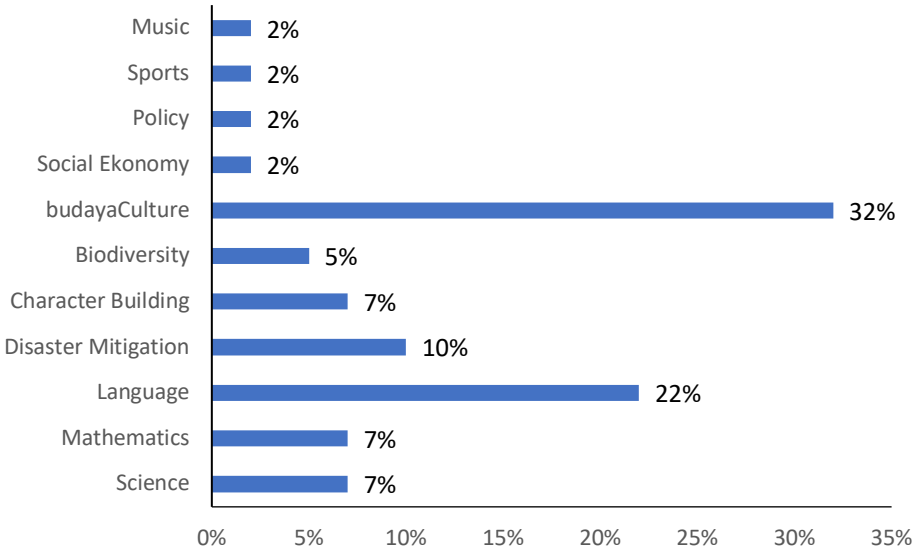

Figure 3. Percentage of local wisdom research domains in learning

Of the 40 articles selected for further analysis, the most researched subject area was culture, followed by language, disaster mitigation, science, math, and character education with equal percentages (Figure 3). This finding shows the breadth of local wisdom

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IJORER, Vol. 6, No. 5, September 2025
Page 1482-1497

research, with a diverse focus according to the context and needs of each field of science (Agyeman, 2014). It also indicates the potential of integrating local wisdom in various disciplines to enrich students' learning and understanding.

In terms of the level of education involved in local wisdom research (Figure 4), most (32%) is conducted in higher education, especially in education departments with student teachers as research subjects. Research at this level contributes to understanding how local wisdom can be involved in education, raising awareness and equipping prospective teachers with the ability to address problems in the surrounding environment. For example, research in Taiwan shows a positive response to the involvement of local wisdom in higher education, which opens up opportunities for deeper dialogue to combine Western science with local cultural traditions (Lin, 2020). These findings support the importance of integrating local wisdom in teacher education to prepare them to teach with contextualized and culturally relevant approaches.

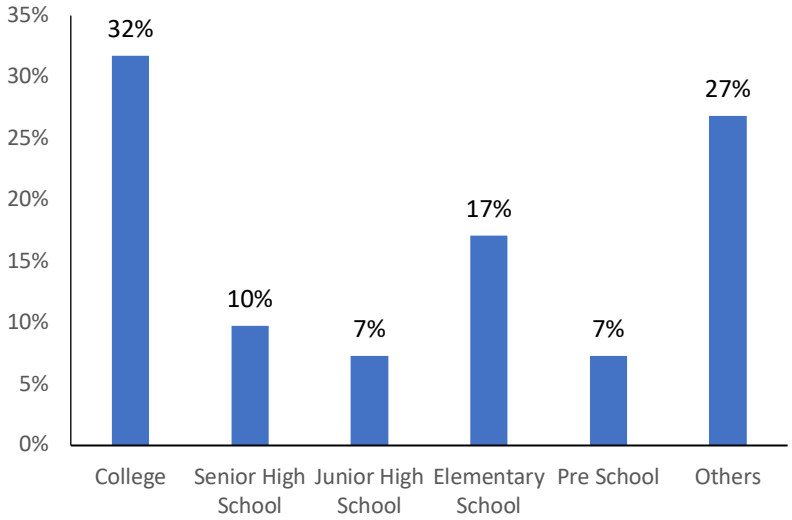

Figure 4. Percentage of education levels adopting local wisdom learning

Research on local wisdom at the tertiary level for prospective teacher students has been conducted in the field of mathematics, to provide a more comprehensive understanding in linking local wisdom with mathematics learning. For example, the application of the GeoGebra concept to tumpeng sewu helps students visualize the proof of theorems and increase learning enjoyment (Safrida et al., 2020). Apart from mathematics, local wisdom is also used in the field of language in higher education as a source of reading and learning to improve students' speaking (discussion) skills. This is in line with the view that local wisdom can be a rich and meaningful learning resource in language learning.

Local wisdom research is also conducted at the high school level (10%), especially in physics, math, and English subjects. The use of traditional games such as engklek in physics learning (ethnoscience) was shown to improve conceptual understanding and learning motivation of high school students (Hariyono et al., 2023). This finding supports the potential of integrating local wisdom in science learning to increase student

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IJORER, Vol. 6, No. 5, September 2025
Page 1482-1497

engagement and understanding of scientific concepts (Pamungkas et al., 2017). Meanwhile, at the junior high school level (7%), the use of traditional toys such as congklak, gobag sodor, cinaboy, and buckshot legendri in learning succeeded in improving students' positive characters, including respect for parents, cooperation, democracy, responsibility, discipline, creativity, communication, curiosity, critical reflection, and perseverance. These results show that local wisdom can be an effective means of developing positive character in students (Wagiran, 2012).

At the primary school level, research on local wisdom in learning was found in 17% of studies. In Russia and West Kalimantan, educational processes that maintain local wisdom reinforce ethnic identity and increase positive character in schools (Kopnina, 2020). In Burkina Faso, Mossi children understand the earth's shape and day-night cycle based on traditional beliefs, describing them geometrically and as areas exposed to light that sometimes goes out and lights up. Other research focuses on developing local wisdom-based products for classroom learning to improve contextual understanding of science phenomena. Hariyono *et al.*, (2023) recommended including traditional games in children's learning, as they increase interest and understanding of concepts due to familiarity in their living environment. These findings reinforce the importance of integrating local wisdom in elementary school science learning to build meaningful and culturally relevant understanding for students (Parmin et al., 2019).

Local wisdom research was also found at the preschool level (3%), with the involvement of traditional medicinal plant harvesting activities, strengthening children's language skills through local languages, and developing folklore animation media. These results show the potential of local wisdom as a rich learning resource for early childhood, which can support the development of language, cultural knowledge, and life skills from an early age. The rest (27%), of the research was conducted in the environment of fishing communities, craftsmen, cultural narratives, elementary-high school teachers, local cultural communities, communities, local history, physical education teachers, foreign language teachers, and school teachers and staff. The diversity of this research context shows the wide scope and relevance of local wisdom in various aspects of community life (N. Lestari et al., 2024).

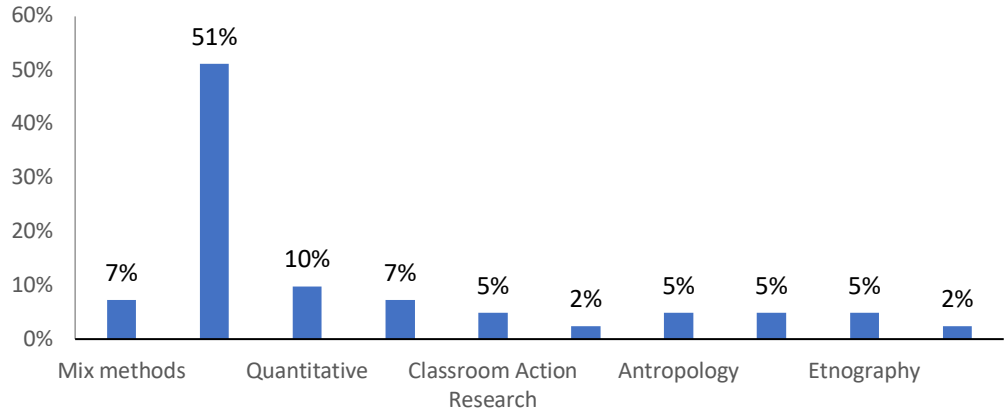

Figure 5. Percentage of research methods that adopt local wisdom learning

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IJORER, Vol. 6, No. 5, September 2025
Page 1482-1497

Based on the synthesis of the 40 selected articles (Figure 5), the most widely used research method is qualitative (51%), followed by quantitative (experimental) at 10%. Research with product development models and mixed methods each amounted to 7%. Meanwhile, classroom action research, anthropological, case study, and ethnographic methods were each used in 5% of the studies. The least used methods were ethnobiology (2%) and phenomenology (2%). Qualitative research allows generalization of the topics involved, while mixed research models are used to obtain more in-depth data (Creswell & Creswell, 2018). This diversity of research methods demonstrates the flexibility and adaptability of local wisdom research in answering various research questions and generating a comprehensive understanding (Sundari et al., 2020).

From these various types of research, the fields and competencies that are the focus of local wisdom research are quite diverse (Table 1). Culture is the main topic, including Samin culture, medicinal plant culture, historical archives, traditional ecology, and traditional health. Language and disaster mitigation are also highlighted, as the ability to recognize nature and culture is closely related to local wisdom. Other fields such as character education, science, and math, although less researched, still show the involvement of local wisdom. This opens a wider space for the development of further research related to local wisdom in education, especially science education (I Wayan Suastra, 2012). This diversity of research focus strengthens the potential of local wisdom as a rich and multidisciplinary learning resource.

Table 1. Local wisdom learning competencies in various fields of science

Field	Competence
Science	Science, astronomy, and attitude science skills
Math	Reasoning and problem-solving, trigonometry
Language	Language skills
Disaster mitigation	Disasters
character education	Character education
Biodiversity	Biodiversity
Culture	Samin culture, medicinal plant culture, historical archives, traditional ecology, traditional health,
Socio-economic	Sociocultural
School policy	Research-based curriculum
Sports	Sports
Music	Cross-cultural competence

The trend of published articles on learning research involving local wisdom from 2018 to 2023 was a rapid increase from 2018 to 2019, although it declined in 2020. However, the graph shows a slow and continuous increase until 2023, indicating that the interest in research related to local wisdom is still in demand and becomes an opportunity for further research. This trend is in line with the increasing global awareness of the importance of preserving and revitalizing local wisdom in facing the challenges of modernity and changing times (Mungmachon, 2012).

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p-ISSN : 2721-852X ; e-ISSN : 2721-7965
IJORER, Vol. 6, No. 5, September 2025
Page 1482-1497

Looking at the distribution of countries conducting local wisdom research, it is interesting that developed countries such as the United States and the United Kingdom top the rankings, while Indonesia, which is rich in cultural sources of local wisdom, is ranked third. This finding shows that local wisdom is not only researched in developing countries but also in developed countries known for their scientific and technological advances. This indicates that local wisdom remains a source of inspiration for technological development, even in developed countries. This phenomenon also reinforces the urgency of preserving and developing local wisdom as a valuable and globally relevant cultural heritage.

Discussion

Local wisdom has relevance in multidisciplinary education. This research shows that local wisdom has a strategic role in learning, not only as a cultural preservation effort but also as a relevant multidisciplinary approach. With 32% of studies conducted in higher education, local wisdom has proven to be an important resource for preparing future teachers in developing context-based learning (Lin, 2020). This integration enables more meaningful learning, improves concept understanding and builds critical thinking skills. However, the low percentage of research at the primary and secondary school levels (17% and 10% respectively) signifies a lack of attention at these levels of education that have great potential to build the foundation of science literacy and student character early on. Therefore, local wisdom-based curriculum development strategies need to be extended to all levels of education (Safrida et al., 2020).

Qualitative methods dominated with 51% of the total studies, indicating a focus on in-depth exploration of local wisdom as a learning resource. However, only 10% of studies used quantitative methods, while blended approaches and product development accounted for 7% each (Creswell & Creswell, 2018). This data highlights the need to increase experimental research that can empirically measure the impact of local wisdom integration on student learning outcomes. More quantitative approaches can provide strong evidence to support educational policy decisions and help design more effective and scalable learning strategies (Sundari et al., 2020).

The analysis shows that local wisdom is applied to various disciplines, including culture (30%), language (20%), disaster mitigation (15%), character education (15%), and science (10%) (Dewi et al., 2019). The dominance of the cultural field reflects the great potential of local wisdom as a bridge between tradition and modern science. However, the low proportion of applications in science and mathematics suggests an opportunity to further integrate local wisdom in science and STEM literacy. Competencies such as problem solving, critical thinking skills, and science literacy can be developed through local wisdom-based approaches, which are relevant to the needs of the modern era (Risdianto et al., 2021).

Globally, the trend of research on local wisdom has increased significantly from 2018 to 2023. Developed countries such as the United States and the United Kingdom dominate the publications, while Indonesia, although rich in local wisdom resources,

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IJORER, Vol. 6, No. 5, September 2025
Page 1482-1497

only ranks third (Mungmachon, 2012). This shows that Indonesia has a great opportunity to be more active in this research, not only to preserve local culture but also to make a global contribution in the development of local wisdom-based education. This trend shows the importance of increasing research capacity, especially in international scientific publications, which can strengthen Indonesia's position in the global discourse on local wisdom-based education (I. B. Lestari et al., 2021).

The results of this study have significant implications for policy makers, educators and researchers. The integration of local wisdom not only enriches the learning experience but also supports cultural preservation and strengthening of local identity. By paying attention to the need for developing specific local wisdom-based teaching materials and teacher training, this approach can increase the relevance and meaningfulness of learning at various levels of education (N Nazifah & Syamina, 2021). In addition, evidence-based policy support is needed to ensure the sustainability and effectiveness of local wisdom implementation in education. Future research is expected to address these challenges with a more inclusive, multidisciplinary and sustainable approach.

Implications and recommendations

Overall, the results of this study show that local wisdom has broad potential to be integrated into learning at various levels of education and disciplines. Local wisdom is not only relevant in culture and language learning, but also in science, mathematics, character education, and other fields. The integration of local wisdom in learning can improve conceptual understanding, learning motivation, critical thinking skills, and positive character development in learners. In addition, the inclusion of local wisdom in education can also strengthen cultural identity, increase the relevance of learning to the local context, and support the preservation of cultural heritage. However, there is still ample room for further research on effective local wisdom integration strategies, the development of local wisdom-based teaching materials, and the long-term impact of local wisdom-based learning approaches on learning outcomes and learner character. By considering the diversity of cultures and local wisdom in Indonesia, future studies are expected to make richer and more meaningful contributions to the development of contextual, meaningful, and culturally oriented education.

CONCLUSION

Systematic Literature Review (SLR) on local wisdom in learning shows that research in this field has been conducted widely, covering various disciplines, education levels, and aspects of learner competence. Of the 236 documents analyzed, four main clusters were found that illustrate the diversity of research topics, ranging from demographic, cultural, and educational aspects, to thematic analysis. Local wisdom is not only relevant in social and humanities fields, but also related to disciplines such as medicine, engineering, agriculture, computer science, and earth and planetary sciences. Most research is conducted in universities (32%), followed by elementary schools (17%), high schools (10%), and junior high schools (7%), with the dominant research methods being

p-ISSN : 2721-852X ; e-ISSN : 2721-7965
IJORER, Vol. 6, No. 5, September 2025
Page 1482-1497

qualitative (51%), quantitative (10%), product development (7%), and mixed-methods (7%). Publication trends show an increase in research interest from 2018 to 2023, with developed countries such as the United States and the United Kingdom dominating publications in this field. The results of this SLR reinforce the potential of local wisdom as a rich and multidisciplinary learning resource, which can enhance learners' conceptual understanding, learning motivation, critical thinking skills, and positive character development, as well as support the preservation of cultural heritage.

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