Integrating Ethnobotany and Indigenous Knowledge into Higher Education Curricula: Insights from a Global Biobliometric Analysis

Fenky Marsandi, Eddy Sutadji, Iwa Kuntadi, Fahmi Rizal, Andika Bagus Nur Rahma and Hidayatul Fajri

Correspondence

Fenky Marsandi[1*], Eddy Sutadji[2], Iwa Kuntadi[3], Fahmi Rizal[4], Andika Bagus Nur Rahma[2] and Hidayatul Fajri[5]

[1]Research Center for Ecology and Ethnobiology, Research Organization for Life Sciences and Environment, National Research and Innovation Agency (BRIN), Cibinong, Bogor, Indonesia 16911
[2]Department of Mechanical Engineering, Universitas Negeri Malang, Malang, Indonesia
[3]Universitas Pendidikan Indonesia, Fakultas Pendidikan Teknologi dan Kejuruan Jl. Dr. Setiabudhi No. 229 Bandung 40154
[4]Pendidikan Teknologi dan Kejuruan, Universitas Negeri Padang, Indonesia
[5]Center for Biomedical Research, Research Organization for Health, National Research and Innovation Agency (BRIN), Cibinong, Bogor, Indonesia 16911

*Corresponding Author: fenkysandi90@gmail.com

Ethnobotany Research and Applications 30:17 (2025) - http://dx.doi.org/10.32859/era.30.17.1-12
Manuscript received: 02/12/2024 - Revised manuscript received: 07/02/2025 - Published: 09/02/2025

Review

Abstract

Background: Indigenous knowledge and ethnobotany are essential to preserving ecological sustainability, biodiversity, and cultural heritage. Its inclusion in higher education curricula is still somewhat limited, despite its significance. In order to preserve cultural identity and address global issues, it is imperative that traditional knowledge be included into academic frameworks as the demand for sustainable education grows.

Methods: To investigate global trends in incorporating ethnobotany and indigenous knowledge into higher education curricula, this study uses bibliometric analysis. VOSviewer and Biblioshiny were used to evaluate data gathered from the Scopus database (1997-2024) in order to find new research themes, collaborative networks, and publication trends.

Results: In response to the sustainable development goals, ethnobotany and the integration of indigenous knowledge have garnered a great deal more scholarly attention, especially after 2010. As a global leader, Indonesia contributes the most citations and publications. Network analysis emphasizes how important local knowledge is in building context-sensitive and transdisciplinary teaching methods, which promotes curriculum design innovations.

Conclusions: There is revolutionary potential for sustainable education when ethnobotany and indigenous knowledge are included into higher education. This integration is a calculated step toward creating innovative teaching practices that are globally adaptive and culturally appropriate.

Keywords: Ethnobotany, Indigenous knowledge, Higher education, Curriculum, Bibliometric analysis

Background

Indigenous knowledge and ethnobotany are crucial for maintaining ecosystem sustainability, biodiversity, and rich cultural legacy (Akalibey *et al*., 2024). In addition to reflecting the harmonious coexistence of humans and nature, this knowledge forms the basis for improvements in a number of fields, such as food, health, and the environment (Díaz *et al*., 2015). However, traditional knowledge is seriously threatened by globalization and the rapid pace of modernity. Traditional knowledge transfer to newer generations has decreased as a result of cultural uniformity, environmental deterioration, and fast socioeconomic development. Accordingly, attempts to protect ecological and social sustainability may be jeopardized by cultural deterioration and the loss of indigenous values (Banda *et al*., 2024).

In this regard, the key difficulty is to preserve indigenous wisdom and ethnobotanical knowledge for the present while preventing their extinction (Mulu *et al*., 2020). Higher education is one of the strategic ways needed to preserve and strengthen traditional knowledge. Higher education can reconcile tradition and innovation by including ethnobotany and indigenous knowledge into courses, promoting communication between contemporary science and regional values (Seerangan & Ravi, 2023). In addition to promoting the preservation of traditional knowledge, this initiative opens doors for transdisciplinary innovations that tackle social and environmental issues locally and globally (Lawrence *et al*., 2022).

In order to bridge the gap between conventional knowledge and contemporary innovation, higher education is strategically important. Through the integration of ethnobotany and indigenous knowledge into their curricula, educational establishments can serve as centers for conserving and transforming information pertinent to regional and worldwide issues. In addition to promoting the preservation of traditional knowledge, this combination creates opportunities for the development of transdisciplinary and contextually relevant scientific breakthroughs (Seerangan & Ravi, 2023).

Studies on the incorporation of ethnobotany and indigenous knowledge into higher education are still scarce, despite the field's enormous potential. Moreover, not much has been done to comprehend worldwide research patterns on this subject. A useful technique for looking at publication trends, partnerships, and important issues in this area is bibliometric analysis, which offers thorough information for creating successful integration plans. Thus, the purpose of this paper is to examine global trends in the integration of indigenous knowledge and ethnobotany into higher education curricula. This study uses bibliometric analysis to identify existing scholarly contributions and offer academics and policymakers strategic ideas for creating higher education that fosters cultural innovation and sustainable knowledge preservation.

Materials and Methods

This study employs a bibliometric approach to analyze global trends related to the integration of ethnobotany and indigenous knowledge into higher education curricula. The bibliometric method was chosen for its ability to provide a comprehensive mapping of scientific publications, researcher and country collaborations, and emerging key themes in this topic (Arjaya *et al*., 2024).

Data Collection

Research data were sourced from the Scopus database, recognized as one of the largest and most reputable repositories of scientific literature worldwide. Keywords included terms such as *ethnobotany*, *indigenous knowledge*, *local wisdom*, *higher education curriculum*, and *sustainability*, among other relevant combinations. Inclusion criteria encompassed articles published in English-language international journals between 1997 and 2024. Review articles, empirical studies, and conceptual analyses were included, while articles unrelated to the topic were excluded. Data were saved in Comma Separated Values (CSV) format and cleaned using OpenRefine software before being analyzed in VOSviewer.

Data Analysis

The collected bibliometric data were analyzed using two main software tools VOSviewer and Biblioshiny (R-based). VOSviewer used for visualizing collaboration networks among researchers, relationships between countries, and topic interconnections based on keyword and citation analyses and Biblioshiny (R-based) applied to conduct statistical bibliometric analysis, including annual publication trends, citation patterns, and identification of the most influential articles in this field.

Analysis Stages

This study focused on analyzing publication trends to observe the development of integrating ethnobotany and indigenous knowledge into higher education over time. Additionally, it examined international collaboration by evaluating research relationships among countries, highlighting leading nations in the field. To uncover key themes, a keyword analysis and

network visualization were conducted, identifying the main topics and frequently discussed subtopics in the literature. Furthermore, influential articles, journals, and researchers contributing significantly to this area were identified through citation analysis.

Data Validation and Interpretation

Findings were validated by comparing results from both software tools to ensure data consistency. Subsequent interpretation focused on developing strategic recommendations for integrating ethnobotany and indigenous knowledge into higher education curricula (Table 1).

Table 1. main data information from search results in Scopus

Category	Details
Timespan	1997-2024
Sources (Journals, Books)	92
Documents	147
Annual Growth Rate (%)	12.98
Document Average Age	4.54 years
Average Citations/Doc	8.367
References	5269
Keywords Plus (ID)	572
Author Keywords (DE)	422
Authors	474
Single-Authored Docs	22
Co-Authors per Doc	3.41
International Co-authorship	8.16%

Research Ethics

This study relied entirely on secondary data from publicly available literature, involving no human or animal subjects and therefore requiring no ethical approval. The bibliometric approach adopted in this study provides a global and data-driven perspective to support higher education policymaking grounded in sustainability, cultural innovation, and traditional knowledge preservation.

Results

Using a bibliometric methodology, this study reveals global dynamics around the incorporation of indigenous knowledge and ethnobotany into higher education curricula. Key findings from bibliometric data analysis provide thorough insights into international cooperation, publishing trends, and linked research topics. Additionally, it maps the current popular and scientific studies on the incorporation of indigenous knowledge and ethnobotany into higher education curricula.

Publication Trends, International Collaborations, and Research Themes

Publications addressing ethnobotany, indigenous knowledge, and their incorporation into higher education have significantly increased between 1997 and 2024. The previous ten years have seen a dramatic increase of publications, especially after 2009, when the Sustainable Development Goals (SDGs) were put into action and the conversation around sustainable development gained momentum. This subject has drawn more attention, especially when it comes to community-based resource management, food security, health, and environmental education.

The research also analyzed the distribution of documents, citations, and international collaboration strength within studies on the integration of ethnobotany and indigenous knowledge into higher education. The following table summarizes the bibliometric data:

Table 2. Global Dynamics in Ethnobotany and Indigenous Knowledge Research

Country	Documents	Citations	Total Link Strength
Indonesia	105	421	4
United States	15	68	3
Thailand	10	96	1

United Kingdom	3	72	2
Malaysia	2	126	1
Japan	2	19	1
China	2	65	1
Taiwan	2	35	1
Colombia	2	10	1
Australia	2	13	1

Indonesia dominates with the highest number of publications (105 documents) and a total of 421 citations, reflecting the country's significant role in related research. Its rich biodiversity and abundant cultural heritage make Indonesia a central hub in the global discourse on ethnobotany and indigenous knowledge. Malaysia and Thailand also show considerable contributions. Malaysia, although it has only two documents, recorded a very high citation count (126), indicating that research from this country is highly relevant and influential within the global scientific community. Thailand (10 documents, 96 citations) demonstrates strong contributions within Southeast Asia. Meanwhile, the United States and the United Kingdom consistently contribute to global discourse, with 15 and 3 documents, respectively, along with significant citations (68 and 72). This indicates strong research capacity and engagement with cross-cultural themes. Countries such as China (2 documents, 65 citations) and Taiwan (2 documents, 35 citations) show that while their contribution in terms of document count is small, their research has a high citation rate, signaling strong academic quality and thematic relevance. Colombia, despite being in South America with rich biodiversity, recorded only 2 documents with 10 citations. This substantial potential requires further exploration to enhance the scientific contributions from the region.

Furthermore, there is data regarding author contributions in terms of document count, citations, and link strength to gain insights into individual contributions in this field (Table 3). Several authors have made greater contributions in terms of the number of published documents. For example, Mubaroq, Sugeng Rifqi, Widiaty, Isma, and Winarni, Retno each have 3 documents. Although not all of these documents have the same number of citations, the volume of publications indicates continuity and consistency in producing scholarly work in the field of ethnobotany and local wisdom in supporting higher education curricula.

Table 3. Author Contributions in Terms of Document Count, Citations, and Link Strength

Author	Documents	Citations	Total Link Strength
ana,a	2	9	5
darmawan, deni	2	11	1
dwiningrum, siti irene astute	2	16	0
harrison, patricia	2	3	0
kurniawan, dwi agus	2	19	0
lestari, nurdiyah	2	4	2
misbah, m.	2	16	0
mubaroq, sugeng Rifqi	3	15	6
Nursalam	2	4	0
saddhono, kundharu	2	2	1
Suciati	2	6	3
Sukiman	2	2	0
suprapto, n.	2	40	0
suryadi, edi	2	8	1
suyanto, slamet	2	4	2
Usmeldi	2	9	0
widiaty, isma	3	15	6
winarni, retno	3	68	1
Yufiarti	2	7	0

Some authors with a limited number of documents have managed to achieve relatively higher citation counts, such as Winarni, Retno with 68 citations, and Mubaroq, Sugeng Rifqi and Widiaty, Isma with 15 citations each. This indicates that although the number of publications by these authors is smaller than that of others, their work is significantly recognized by other scholars and has made a substantial contribution to the topic. Meanwhile, some authors such as Harrison, Patricia, Sukiman, and Nursalam have lower citations (below 10), which may reflect a lack of broader dissemination or global

recognition of their research. This could be due to themes or approaches that are more specific or limited to a local context, receiving less international attention (Shayan *et al*., 2022).

The analysis highlighting the authors' contribution patterns to the topic of integrating ethnobotany and local wisdom into higher education curricula is also illustrated in the following flow diagram (Figure 1).

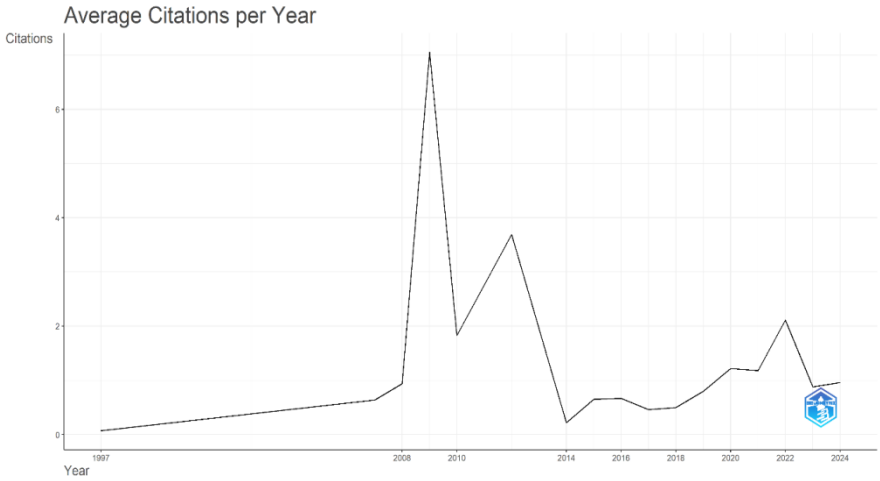


Figure 1. Average Citation Trends per Year

Additionally, the analysis highlighting the authors' contribution patterns to the topic of integrating ethnobotany and local wisdom into higher education curricula is also illustrated in the following flow diagram (Figure 1).

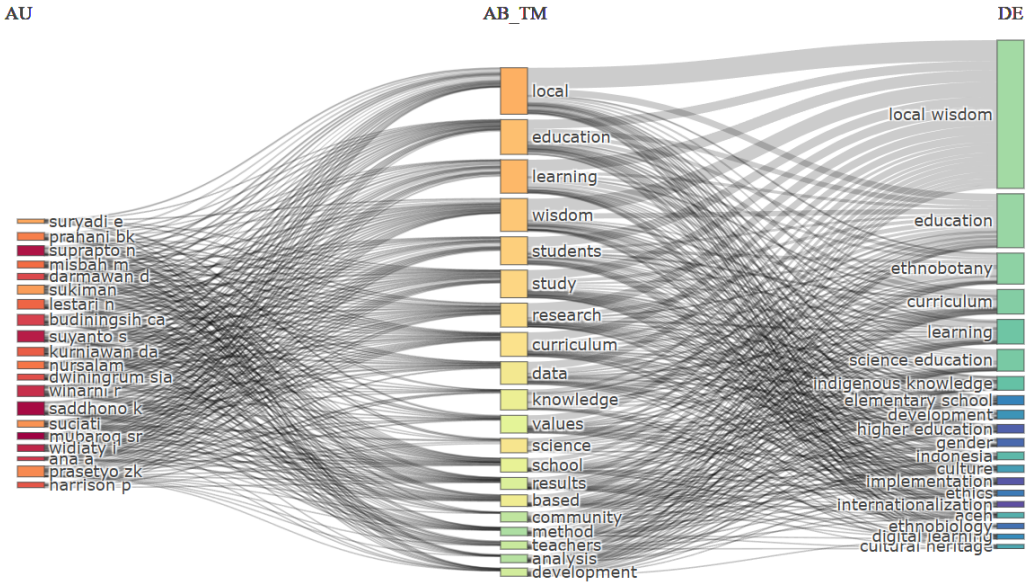


Figure 2. Flow Diagram (Sankey Diagram) of the Relationship Between Three Key Elements: Authors (AU), Abstract Terms (AB_TM), and Keywords (DE).

Some key authors, such as Suryadi E, Panday IBK, and Harrison P, have made significant contributions to this research. These authors have laid a strong foundation for research in the development of curricula based on local wisdom and ethnobotany education. Their contributions reflect geographical diversity, indicating global interest in this issue, even though most of the authors appear to come from regions with rich local traditions. In terms of abstract terms, frequently appearing terms such as *local*, *education*, *learning*, *wisdom*, *students*, and *curriculum* reflect the focus of the research on a local wisdom-based approach to enriching higher education learning experiences. Terms like *knowledge*, *science*, and *values* indicate that this integration aims not only to preserve culture but also to encourage scientific innovation and character development. For keywords, terms like *local wisdom*, *education*, *ethnobotany*, and *curriculum* point to the core theme of this research: integrating local wisdom and ethnobotany into higher education. Additional keywords such as *indigenous knowledge*, *science*

education, and *higher education* underline that this research lies at the intersection of tradition and modernity, striving to address the challenges of globalization in education.

This diagram shows a strong flow from authors to abstract terms and keywords, indicating that this research covers various related dimensions, such as curriculum innovation, value-based teaching, and interdisciplinary approaches. Some authors, like Harrison P, tend to contribute to keywords with a global dimension such as *internationalization* and *cultural heritage*, while others focus more on local aspects like *community* and *values*. This analysis underscores the importance of integrating local wisdom and ethnobotany into higher education systems to strengthen cultural identity while enhancing curriculum relevance in addressing contemporary challenges, such as environmental sustainability and the recognition of local knowledge.

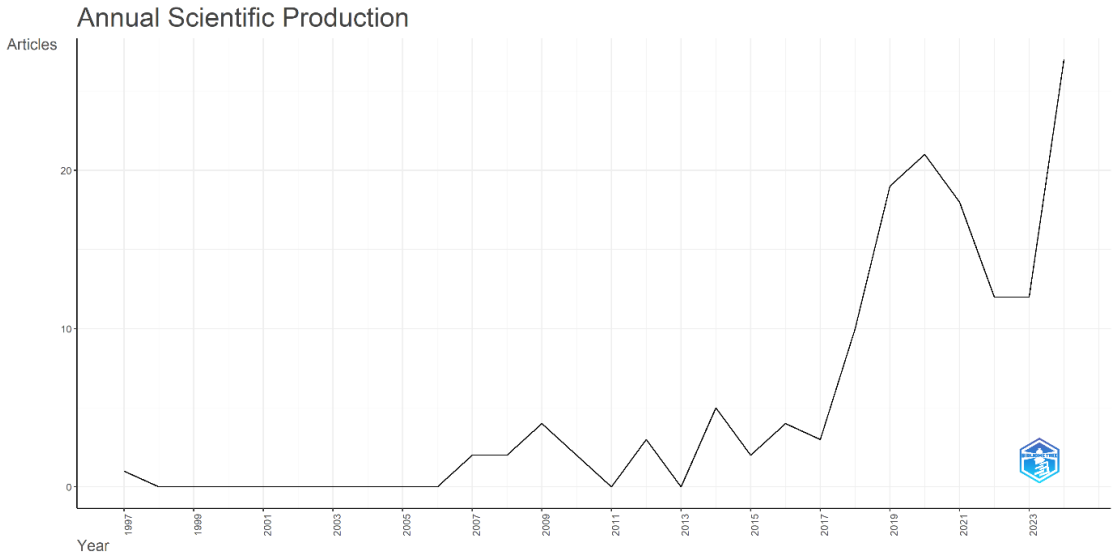


Figure 3. Annual Scientific Production Graph Related to the Research

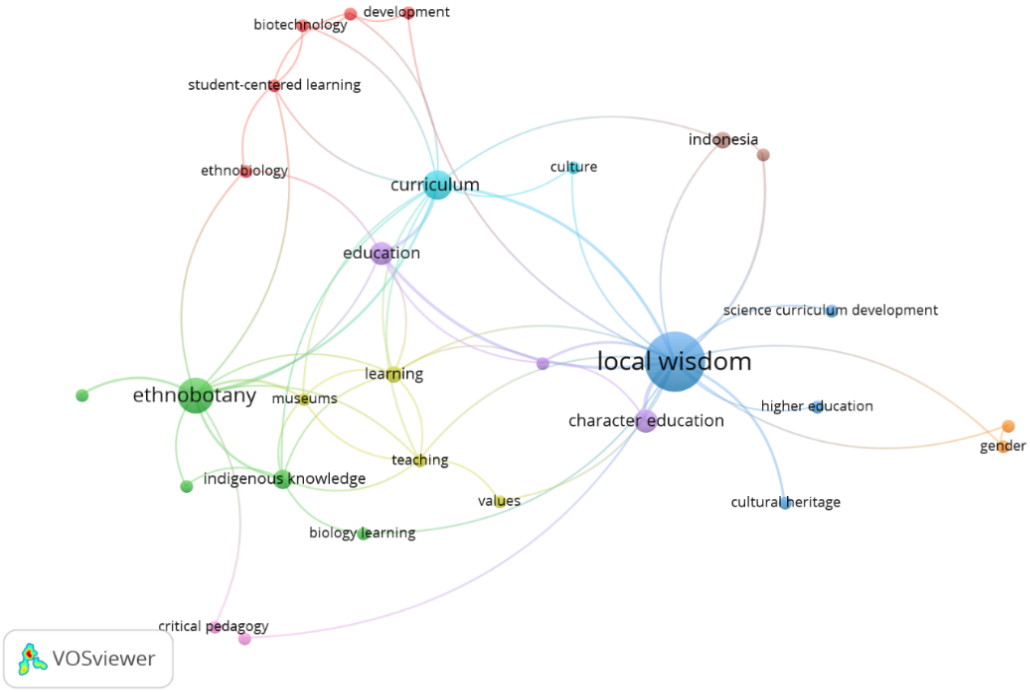
Based on the annual scientific production graph (Fig 3), several important patterns in publications related to this topic can be identified. Overall, there are two dominant periods visible in the graph: Period of Significant Publication Increase: During the years 2017-2020 and 2023-2024, there was a notable surge in the number of publications, indicating that interest in the integration of ethnobotany and indigenous knowledge into higher education curricula has been increasing.

Mapping of Scientific Knowledge and Current Popular Research Trends

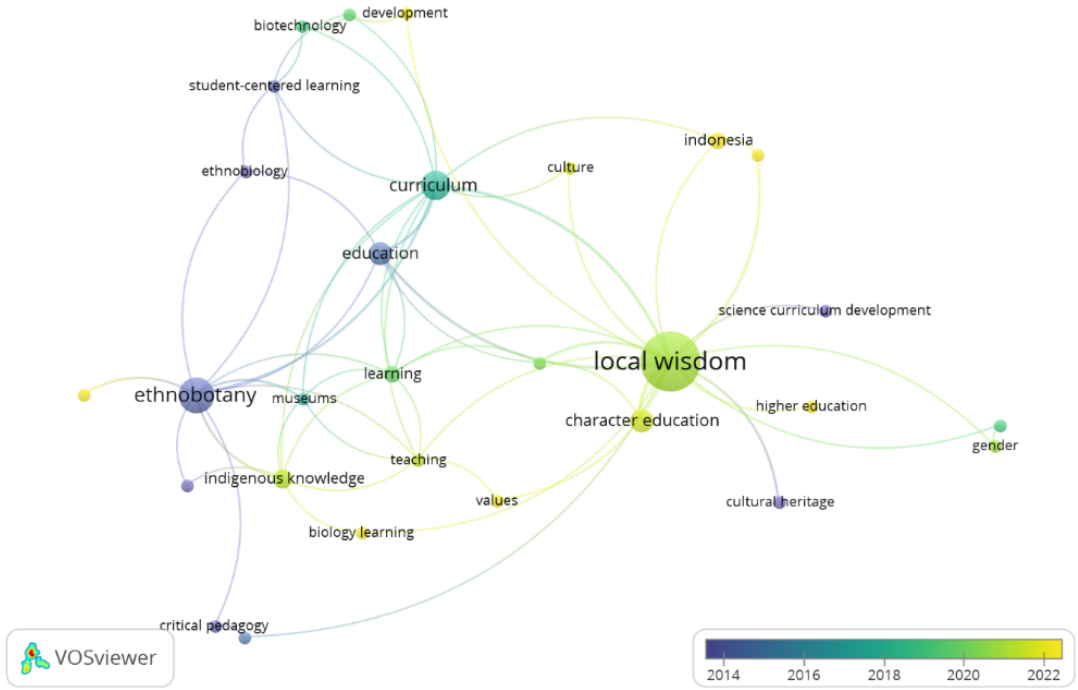
The mapping of scientific knowledge and current trends related to the integration of ethnobotany and indigenous knowledge into higher education curricula aims to provide an overview of the scientific mapping in the field of ethnobotany and indigenous knowledge, as well as to identify the current popular trends related to this topic, particularly in the context of its integration into higher education curricula.

The bibliometric analysis results using VOSviewer software show thematic relationships between *ethnobotany*, *local wisdom*, and *curriculum*, particularly in the context of higher education. This network visualization explains several key clusters that interact significantly with each other. Local wisdom has a significant connection with *character education*, emphasizing that local values play an important role in shaping students' morals and ethics. Character education based on local wisdom not only teaches students to understand local cultures but also encourages respect for cultural diversity.

In this context, an interpretation of the analysis presented scientifically, related to the depiction of each quadrant, theoretical relevance, and its practical implications in the integration of ethnobotany and local wisdom into higher education curricula, will help to see how the niche research themes are still being pursued (Figure 5).



(a)



(b)

Figure 4. Network Visualization Graph (a) and Overlay Visualization (b) Results from VOSviewer on the Integration of Ethnobotany and Local Wisdom into Higher Education Curricula

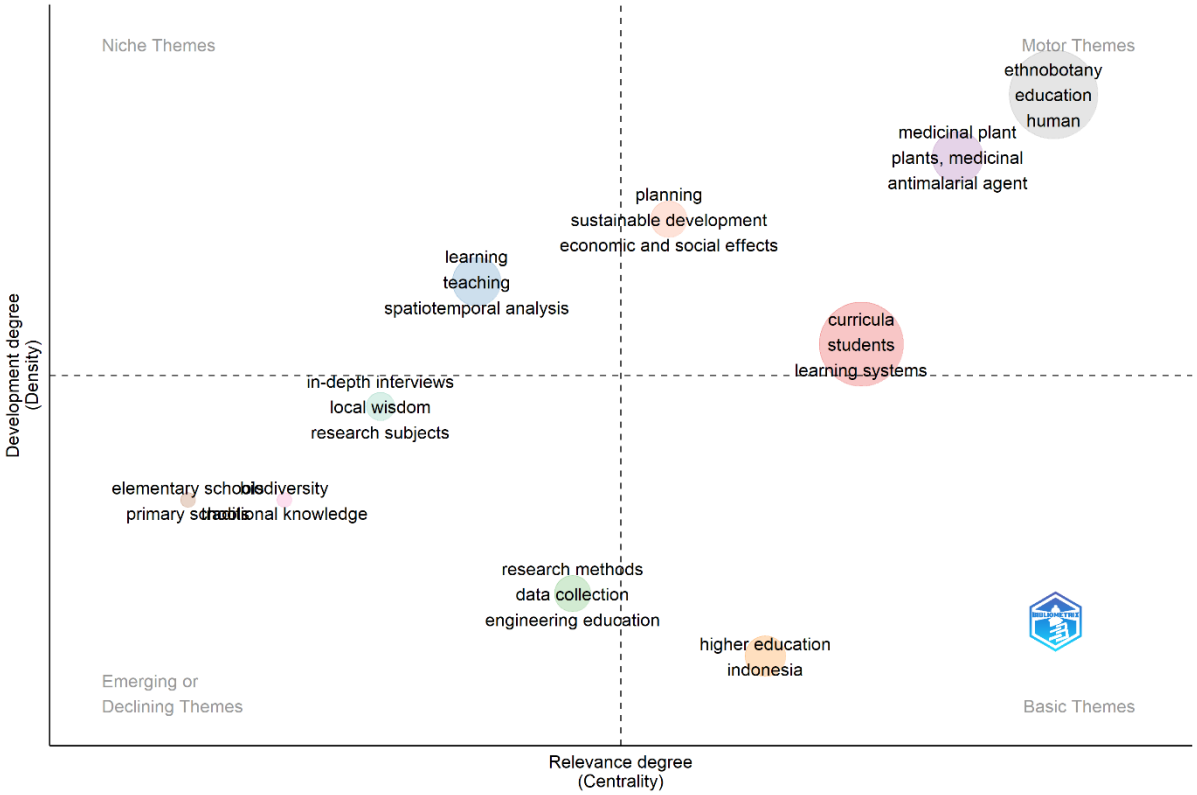


Figure 5. In-depth Interpretation Graph of Each Quadrant, Theoretical Relevance, and Practical Implications in the Integration of Ethnobotany and Local Wisdom into Higher Education Curricula

Discussion

The strength of international collaboration is reflected in the link strength between countries. Indonesia has the highest total link strength (Table 1), indicating an active role in global collaborations, likely supported by partnerships with universities, research institutions, and international organizations. The United States and the United Kingdom have total link strengths of 3 and 2, respectively, reinforcing their positions as centers for cross-national collaboration. Other countries with low link strength (1) suggest that their research tends to be more local or regional, with room still available for expanding global collaborations. Indonesia's dominance in document count and citations indicates that the country has significant potential to become a key center for global ethnobotany research. Strengthening international collaborations and enhancing research capacity will further expand its influence. Countries such as Colombia and other biodiversity-rich regions could leverage the findings of this study to increase their contributions to the global discourse. Countries with fewer documents but high citations, such as Malaysia, highlight that research quality is more important than quantity for achieving global influence (Agarwal *et al*., 2016).

This underscores the importance of international collaboration in strengthening research on ethnobotany and indigenous knowledge. Efforts to enhance global connectivity, particularly between developed and developing nations, will accelerate the integration of traditional knowledge into higher education while supporting global sustainability goals (Kumar *et al*., 2021). Strategies to improve publication accessibility, cross-country cooperation programs, and strengthening local research capacity should be prioritized to optimize the academic and practical impact of this theme.

Regarding to author contributions in terms of document count, citations, and link strength to gain insights into individual contributions in this field (Table 3), Authors with a large number of documents do not necessarily have a major impact in the global academic community. However, their work still contributes to the development of the literature, even with lower citation counts. This suggests opportunities to improve the quality of their research and broaden the dissemination of their work to a wider audience. Authors with fewer documents but higher citations, such as Winarni, Retno, demonstrate that the quality of research and the relevance of the topic discussed can have a significant impact on the scientific community, even with a limited number of publications. High link strength indicates authors who are active in international collaboration, which can potentially enhance the impact of their research. Authors with lower link strength need to focus more on international collaboration to expand their networks and increase the visibility of their research (Tahamtan *et al*., 2016).

Researchers who wish to increase their citation count and impact in the scientific community should expand their international collaboration networks and focus on the quality of their publications, as well as their relevance to emerging global issues. Authors with few citations and low link strength should consider being more active in interdisciplinary collaborations and increasing the visibility of their work through publications in reputable international journals and other academic forums. Improving the quality of research that focuses on topics relevant to global issues will attract more attention from academics and policymakers worldwide (D'Este & Robinson-García, 2023).

The results of this analysis (Figure 2) suggest that integrating local wisdom and ethnobotany into higher education curricula has the potential to: Strengthen recognition of traditional knowledge in the context of modern education; Bridge local cultural heritage with global approaches to education sustainability; Address the need for value-based curricula that support sustainable development and biodiversity conservation (Arjaya *et al*., 2024). For further development, this study could be directed toward case studies of curriculum implementation in various universities in regions with rich cultural traditions to evaluate the resulting social, cultural, and academic impacts.

Annual scientific production has important patterns in publications related to the topic to be covered. In this topic, the phenomenon can be linked to the growing global awareness of the importance of cultural preservation, sustainability, and the contribution of tradition in shaping educational policies at the global level (Kiarie, 2024). Then, Stable or Declining Period: Previous years, around 1997 to 2017, showed a more stagnant or even declining trend in publication numbers. This may have been due to limited attention to the topic or research priorities focusing on other more pressing issues, such as globalization, modernization, or other environmental challenges.

Terms such as *values* and *teaching* indicate that local wisdom values are often used as the foundation for developing culturally relevant teaching materials (Masrukhi *et al*., 2024). This creates a synergy between local traditions and the needs of modern education. Ethnobotany, defined as the study of the relationship between humans and plants in cultural contexts, becomes an important component in integrating local wisdom into education. The connection between *ethnobotany* and *local wisdom* suggests that the use of local natural resources—such as plants that have cultural and traditional value—can be used to teach local values in a practical way. *Indigenous knowledge* is closely tied to ethnobotany, indicating that local wisdom-based education often involves traditional knowledge passed down through generations. In this context, ethnobotany can be used as a tool to connect science lessons with local cultural values, such as studying the use of plants in traditional medicine or food processing (Adela *et al*., 2023).

The close relationship between *curriculum*, *learning*, and *local wisdom* shows that the development of local wisdom-based curricula requires an interdisciplinary approach. For example, using ethnobotany in science learning allows students to study plant biology while understanding the cultural values associated with the use of these plants (Fauzi *et al*., 2024). A *student-centered learning* approach in this context creates space for students to learn through direct exploration of local ecosystems, including observing the use of traditional plants in their environment. This not only increases student engagement but also helps them understand the relevance of scientific knowledge in everyday life (Tang, 2023).

Local wisdom is also related to *science curriculum development* and *higher education*, demonstrating efforts to integrate local values into science curricula at the higher education level. This approach can enhance the relevance of science education to local community needs, such as creating community-based solutions for environmental or health challenges. *Cultural heritage* and *gender* are also connected to *local wisdom*, reflecting the social and cultural dimensions of local wisdom. In this context, education can play an important role in documenting and preserving cultural heritage by training younger generations to appreciate traditional values that may be threatened by modernization. The term *Indonesia* that appears in the analysis indicates that this study has a specific geographical focus, highlighting the importance of integrating local values in the context of developing countries like Indonesia. A local wisdom-based education system is not only relevant for preserving local cultures but also serves as an educational model that can be adapted in other countries with similar cultural contexts (Verawati & Wahyudi, 2024).

Figure 4.b shows the temporal dimension (2014-2022), indicating that the focus on local wisdom and ethnobotany in the curriculum context has increased in recent years. This is reflected in the intensity of the yellow color in terms such as *Indonesia* and *character education*, which mirrors recent research trends in the field. The term *gender* connected to *local wisdom* suggests that this study also considers the social dimension in the development of local wisdom-based curricula. This can include the influence of gender in cultural preservation and the implementation of local values in education (Yusuf *et al*., 2024). The results of this analysis provide strong evidence that the integration of ethnobotany and local wisdom into higher

education curricula is not only relevant but also strategic in supporting cultural preservation, character education, and the development of learning based on local traditions. This encourages the development of a curriculum model that is responsive to local contexts, while also opening up further research opportunities to evaluate the effectiveness of this approach on a global scale (Arjaya *et al*., 2024).

From the results of this quadrant analysis (Figure 5), it is clear that the integration of ethnobotany and local wisdom into higher education curricula requires an interdisciplinary approach that touches on ecological, socio-economic, and educational aspects (Tunon *et al*., 2024). *Motor themes* serve as the driving force of research that can be adopted on a global scale, while *niche themes* and *emerging themes* offer space for further exploration related to local preservation and adaptation.

The upper-right quadrant shows themes that are strategically positioned, with high centrality and density, highlighting their significance and rapid development in research. In this context, themes such as *ethnobotany*, *education*, *medicinal plants*, *humans*, and *antimalarial agents* serve as major drivers in ethnobotany research integrated into higher education curricula. This position emphasizes the importance of ethnobotany as a scientific approach that supports local wisdom-based education and its application in health fields. The integration of medicinal plants as pharmaceutical agents into the curriculum is not only locally relevant but also aligns with the Sustainable Development Goals (SDGs), particularly in health (SDG-3) and quality education (SDG-4) (Zickafoose *et al*., 2024).

The upper-left quadrant includes themes with high development but low relevance, such as *planning*, *sustainable development*, and *economic and social effects*. These themes tend to delve into specific aspects but are less integrated with broader themes. This suggests that ethnobotany research is not only ecological or pharmaceutical but also has significant social and economic dimensions Click or tap here to enter text.. Local wisdom-based planning can enrich sustainable development approaches, especially in areas that depend on local biological resources. In-depth research can be directed toward evaluating the socio-economic impacts of involving local wisdom in the curriculum, such as enhancing environmental literacy and empowering indigenous communities (Hamid & Jahja, 2016).

The lower-left quadrant shows themes with low centrality and density, such as *traditional knowledge*, *in-depth interviews*, *biodiversity*, and *local wisdom*. These themes reflect areas that have received less attention in primary research but have potential for future development. The placement of these themes indicates that aspects such as in-depth interview-based exploration methods, biodiversity studies, and local wisdom are still underexplored as learning approaches. This underscores the need for strengthening the scientific foundation in integrating local traditions into educational approaches. This research can open new avenues for the development of curricula based on traditional ecological knowledge (TEK) for primary through higher education (Bansal *et al*., 2024).

The lower-right quadrant includes themes with high relevance but low development, such as *curriculum*, *students*, and *learning systems*. These themes indicate foundational research areas that have not yet been deeply explored. This position stresses the urgency of building a local wisdom- and ethnobotany-based education foundation as part of curriculum design. On a global scale, this could support more adaptive educational approaches to cultural and ecosystem diversity. This theme can be applied in developing locally-based pedagogies, such as through interdisciplinary learning programs that combine science, anthropology, and environmental education. A curriculum designed with a local-global approach can provide new insights to students, raise awareness of the importance of local resource preservation, and strengthen international competitiveness (George & Wooden, 2023).

From the results of this quadrant analysis, it is clear that the integration of ethnobotany and local wisdom into higher education curricula requires an interdisciplinary approach that touches on ecological, socio-economic, and educational aspects. *Motor themes* serve as the driving force of research that can be adopted on a global scale, while *niche themes* and *emerging themes* offer space for further exploration related to local preservation and adaptation.

Conclusion

This study demonstrates that integrating ethnobotany and indigenous knowledge into higher education curricula has significant potential to enrich educational experiences and prepare students with holistic, culturally contextual knowledge. Using VOSviewer, the analysis uncovered strong connections between *local wisdom*, *ethnobotany*, *curriculum development*, and *character education*, indicating that local wisdom can serve as a critical element in creating relevant, sustainable, and contextualized higher education curricula. Through ethnobotanical approaches, indigenous knowledge not only supports the

preservation of time-tested traditional knowledge but also contributes to shaping students' character and social values. This, in turn, fosters the development of societies more attuned to the importance of cultural and ecological diversity. Moreover, this integration invites opportunities for developing interdisciplinary curricula that merge modern science with traditional knowledge. Such integration equips students with practical skills and applicable knowledge to address global challenges. Thus, embedding ethnobotany and indigenous knowledge into higher education curricula will not only substantially enrich higher education but also contribute to cultural preservation and ecosystem sustainability—both of which are essential to addressing the global challenges of the 21st century.

Declarations

List of abbreviations: AU-Authors, AB_TM-Abstract Terms, and DE-Keywords, SDGs-Sustainable Development Goals, CSV-Comma Separated Values

Ethics approval and consent to participate: All participants were informed of the purpose of the research. They all gave informed consent to share information.

Consent for publication: The manuscript does not contain any individual person's data in any form. All authors have read and given their approval for the publication of the final manuscript.

Availability of data and materials: The data generated and analyzed are included in this article.

Competing interests: The authors affirm that they have no competing interests.

Funding: This research was supported by funding from Research Collaboration Indonesia (RCI).

Author contributions: FM: Idea and conceptualize article writing. ES: Formulate a draft article manuscript. IK: Methodology section. FR and HF: Results and Discussion Section. ABNR: Ensuring article data is complete and proofreading article manuscripts

Acknowledgements

The authors would like to thank the Indonesian Collaborative Research Program for research funding support.

Literature cited

Adela D, Suastra W, Bagus I, Arnyana, IBP. 2023. Integrasi Indigenous Knowledge Melalui Ethnobotany Dan Ethnoecology Tanaman Lokal Kasepuhan Ciptagelar Dalam Pembelajaran Ipas Di Sd. Jurnal Pendidikan Dasar 11(2):1-9.

Agarwal A, Durairajanayagam D, Tatagari S, Esteves SC, Harlev A, Henkel R, Roychoudhury S, Homa S, Puchalt NG, Ramasamy R, Majzoub A, Dao LyK, Tvrda E, Assidi M, Kesari K, Sharma R, Banihani S, Ko E, Abu-Elmagd M, Bashiri A. 2016. Bibliometrics: Tracking research impact by selecting the appropriate metrics. Asian Journal of Andrology 18(2): 296-309. https://doi.org/10.4103/1008-682X.171582

Akalibey S, Hlaváčková P, Schneider J, Fialová J, Darkwah S, Ahenkan A. 2024. Integrating indigenous knowledge and culture in sustainable forest management via global environmental policies. Journal of Forest Science 70(6): 265-280. https://doi.org/10.17221/20/2024-JFS

Arjaya IBA, Suastra IW, Redhana IW, Sudiatmika, AAIAR. 2024. Global Trends in Local Wisdom Integration in Education: A Comprehensive Bibliometric Mapping Analysis from 2020 to 2024. International Journal of Learning, Teaching and Educational Research 23(7): 120-140. https://doi.org/10.26803/ijlter.23.7.7

Banda LOL, Banda CV, Banda JT, Singini T. 2024. Preserving Cultural Heritage: A Community-Centric Approach to Safeguarding the Khulubvi Traditional Temple Malawi. Heliyon 10(2024): 1-22. https://doi.org/10.1016/j.heliyon.2024.e37610

Bansal S, Sarker T, Yadav A, Garg I, Gupta M, Sarvaiya H. 2024. Indigenous communities and sustainable development: A review and research agenda. Global Business and Organizational Excellence 43(4): 65-87. https://doi.org/10.1002/joe.22237

D'Este P, Robinson-García N. 2023. Interdisciplinary research and the societal visibility of science: The advantages of spanning multiple and distant scientific fields. Research Policy 52(2).

Díaz S, Demissew S, Carabias J, Joly C, Lonsdale M, Ash N, Larigauderie A, Adhikari JR, Arico S, Báldi A, Bartuska A, Baste IA, Bilgin A, Brondizio E, Chan KMA, Figueroa VE, Duraiappah A, Fischer M, Hill R, Zlatanova D. 2015. The IPBES Conceptual Framework - connecting nature and people. In Current Opinion in Environmental Sustainability 14: 1-16. https://doi.org/10.1016/j.respol.2022.104609

Fauzi A, Siswati BH, Ramadani SD. 2024. Low level of local wisdom-based biology education research: What should we do?. Jurnal Pendidikan Biologi Indonesia 10(3): 1098-1106. https://doi.org/10.22219/jpbi.v10i3.36108

George B, Wooden O. 2023. Managing the Strategic Transformation of Higher Education through Artificial Intelligence. Administrative Sciences 13(9): 1-20. https://doi.org/10.3390/admsci13090196

Hamid AR, Jahja RS. 2016. Developing Environmental Education Model Based on Local Wisdom. Komunitas 8(1): 135-144.

Kiarie E. 2024. Cultural Heritage Preservation in the Face of Globalization. International Journal of Humanity and Social Sciences 3(3): 1-14. https://doi.org/10.15294/komunitas.v8i1.4936

Kumar A, Kumar S, Komal, Ramchiary N, Singh P. 2021. Role of traditional ethnobotanical knowledge and indigenous communities in achieving sustainable development goals. In Sustainability 13(6): 1-14. https://doi.org/10.3390/su13063062

Lawrence MG, Williams S, Nanz P, Renn O. 2022. Characteristics, potentials, and challenges of transdisciplinary research. One Earth 5(1): 44-61. https://doi.org/10.1016/j.oneear.2021.12.010

Masrukhi, Wijayanti T, Melynda, Saputri AR. 2024. Character Education, Local Wisdom, and the Profile of Pancasila Students: Challenges and Potential Approach. Indonesian Research Journal in Education 8(1): 350-362. https://doi.org/10.22437/irje.v8i1.34715

Mulu M, Ntelok ZRE, Sii P, Mulu H. 2020. Ethnobotanical knowledge and conservation practices of indigenous people of mbeliling forest area, Indonesia. Biodiversitas 21(5): 1861-1873. https://doi.org/10.13057/biodiv/d210512

Rinto R, Iswari RS, Mindyarto BN, Saptono S. 2023. Bridging the generational gap: Exploring youth understanding on ethnobotanical knowledge and its integration in higher education curricula. Ethnobotany Research and Applications 26: 1-16. https://doi.org/10.32859/era.26.48.1-16

Seerangan C, Ravi RV. 2023. Integrating Traditional Knowledge With Modern Education in The Kolli Hills. International Journal of Business and Administration Research Review, 10(2): 46-58.

Shayan NF, Mohabbati-Kalejahi N, Alavi S, Zahed MA. 2022. Sustainable Development Goals (SDGs) as a Framework for Corporate Social Responsibility (CSR). Sustainability 14(3): 1-27. https://doi.org/10.3390/su14031222

Tahamtan I, Safipour Afshar A, Ahamdzadeh K. 2016. Factors affecting number of citations: a comprehensive review of the literature. Scientometrics 107(3): 1195-1225. https://doi.org/10.1007/s11192-016-1889-2

Tang KHD. 2023. Student-centered Approach in Teaching and Learning: What Does It Really Mean?. Acta Pedagogia Asiana 2(2): 72-83. https://doi.org/10.53623/apga.v2i2.218

Tunon H, Westin A, Ivascu C. 2024. Ethnobotany The Academic Study of Our Relationship with Plants.

Verawati NNSP, Wahyudi W. 2024. Raising the Issue of Local Wisdom in Science Learning and Its Impact on Increasing Students' Scientific Literacy. International Journal of Ethnoscience and Technology in Education 1(1) 42: 42-54. https://doi.org/10.33394/ijete.v1i1.10881

Yusuf R, Arifin AM, Octaviana U, Abbas S, Syawal J, Nurbaya N. 2024. Integrating Local Wisdom in Character Education: A Collaborative Model for Teachers, Parents, and Communities. AL-ISHLAH: Jurnal Pendidikan 16(3): 1-13. https://doi.org/10.35445/alishlah.v16i3.5271

Zickafoose A, Ilesanmi O, Diaz-Manrique M, Adeyemi AE, Walumbe B, Strong R, Wingenbach G, Rodriguez MT, Dooley K. 2024. Barriers and Challenges Affecting Quality Education (Sustainable Development Goal #4) in Sub-Saharan Africa by 2030. Sustainability 16(7): 1-16. https://doi.org/10.3390/su16072657

Zidny R, Sjöström J, Eilks I. 2020. A Multi-Perspective Reflection on How Indigenous Knowledge and Related Ideas Can Improve Science Education for Sustainability. Science and Education 29(1): 145-185. https://doi.org/10.1007/s11191-019-00100-x