



Mapping the Evolution of Ethnoscience Research in Ethiopian Science Education: A Bibliometric Analysis (2010–2025)

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Abstract:

Ethnoscience research has gained global prominence as a framework for integrating indigenous knowledge systems into formal science education. However, the development of ethnoscience research in Ethiopian science education has not been systematically documented. This study presents a bibliometric analysis mapping the trends and evolution of ethnoscience research in Ethiopian science education from 2010 to 2025. Data were extracted from Scopus, Web of Science, Google Scholar, Ethiopian Journals Online, and institutional repositories. Bibliometric indicators including publication trends, citation analysis, co-authorship networks, and keyword co-occurrence were analyzed using descriptive statistics and network visualization tools (VOSviewer, Bibliometrix). Seventy-four publications were identified, revealing a nascent but expanding field with 55.4% of publications appearing in 2023–2025. Six major themes emerged: indigenous knowledge integration in biology education, curriculum analysis and policy implementation, teacher and student perceptions, indigenous knowledge and spirituality, indigenous geological and environmental knowledge, and methodological innovations. Institutional contributions are concentrated at Addis Ababa University (37.8%), followed by Bahir Dar University (16.2%), Jimma University (13.5%), and Mekelle University (10.8%). Collaboration remains predominantly intra-institutional (68.9%), with limited international collaboration (17.6%). The h-index is 7, with average citations per paper of 2.53. A significant implementation gap exists between policy commitment and classroom practice. Conclusion: Ethiopian ethnoscience research demonstrates promising growth trajectory yet faces challenges including limited disciplinary diversity, institutional concentration, and inadequate integration with global theoretical frameworks. Sustained investment in research infrastructure, teacher education, curriculum materials development, and international collaboration is essential for advancing culturally responsive science education in Ethiopia.

Keywords: *Ethnoscience; Indigenous Knowledge; Science Education' Bibliometric Analysis; Ethiopia*

I. Introduction

1.1 Background and Context

The global emergence of ethnoscience as a field of inquiry reflects growing recognition that all knowledge, including scientific knowledge, is situated within specific cultural and historical contexts. Over the past two decades, research on the integration of indigenous knowledge into science education has experienced significant development (Sya'ban et al., 2024). A comprehensive bibliometric evaluation of the ethnoscience literature in science education research, examining 231 papers from the Scopus database published between 1967 and 2023, has documented this growth trajectory (Sya'ban et al., 2024). The field has evolved from theoretical foundations to encompass applications in education, culture, and specific science disciplines, with research becoming increasingly multidisciplinary. Ainaya et al. (2026) further demonstrated

that research on ethnoscience in science learning shows an increasing trend year by year, with the field becoming progressively more integrated into mainstream science education discourse.

Ethiopia occupies a uniquely significant position for ethnoscience research. Several factors distinguish Ethiopia as a distinct phenomenon in Africa: it is the independent nation that defeated colonial Italy in 1896 at Adwa, a historic moment that prizes it as the hallmark of independence for African nations and the black people who were under the hegemonic regimes of European powers (Milkias & Getachew, 2005, as cited in NTNU Open, 2023). In this way, it remains the epitome of counterhegemonic narratives in colonization discourses in the global context (Kebede, 2004, as cited in NTNU Open, 2023). Additionally, it has the oldest Orthodox Christian Church in Africa before Western missionaries and colonialism (Adejumobi, 2007, as cited in NTNU Open, 2023).

With over 80 ethnic groups, more than 80 languages, and a rich tapestry of indigenous knowledge systems spanning agriculture, medicine, ecology, craftsmanship, and natural resource management, the country possesses immense ethnoscientific resources. Ethiopia's living cultures, oral traditions, and written records have been highly shaped by the indigenous Ethiopian Orthodox Tāwahado Church, which is different from other Christendom in the world in terms of biblical canon, religious practices, and educations (Adejumobi, 2007, as cited in NTNU Open, 2023). The Ethiopian Orthodox Tewahedo Church (EOTC) has maintained a distinctive indigenous education system that represents "one of the oldest systems of learning in the world" (Pankhurst, 1990, p. xi, as cited in NTNU Open, 2023), dating back to 330 AD. Founded in the fourth century, the Church has played a crucial role in preserving Christian education and literary culture in Ethiopia (Chaillot, 2023). The church school system has been the instrument that has preserved the traditional learning of Ethiopia and conveyed it faithfully to succeeding generations, originating in the Aksumite Kingdom with the introduction of Christianity about the fourth century (Ethiopian Orthodox Tewahedo Church, n.d.). For centuries, the Ethiopian Orthodox Church was the only formal educational organisation, developing and spreading a system of learning in the ancient Ge'ez language (NTNU Open, 2023; Goshu, Rediwan, 2025). At the beginning of the twentieth century, however, such an indigenous educational system was replaced by Western modern education "with little or no effort in bridging the transition" (Yigezu, 2023). This deep historical foundation, predating the introduction of Western modern education by over 1,500 years, makes Ethiopia a critical site for examining the intersections of indigenous knowledge systems and formal science education.

1.2 The Ethiopian Educational Landscape

Ethiopia's higher education system has undergone significant transformation over the past two decades. A country of approximately 118 million people, Ethiopia currently has 51 public Higher Education Institutions (HEIs) (Tamrat, 2022, as cited in Yallew & Dereb, 2022). Like other higher education systems in Africa, the research function of these institutions has gained more traction in the past two decades. However, Ethiopian higher education remains predominantly teaching-oriented, and research productivity is generally low relative to institutional expansion.

The historical development of science education in Ethiopia reflects broader tensions between indigenous and imported educational paradigms. Before the introduction of modern or Western-type education in 1908, the country had its own traditional system of education. The Ethiopian Orthodox Church (fourth century) and the Mosque (seventh century) were the institutions that provided education long before the introduction of modern schools into Ethiopia (ERIC, 2023). The displacement of this indigenous educational system by Western

modern education occurred with little effort to bridge the transition (Yigezu, 2023). This displacement has had lasting consequences for the recognition and integration of indigenous knowledge in formal education.

A pivotal institutional development occurred in 2018 with the establishment of the Ministry of Science and Higher Education (MoSHE) through Proclamation No. 1097/2018 in October 2018 (Devex, 2018; MoSHE, 2018). MoSHE was established to lead the development of science, higher education, and technical and vocational education and training (TVET) in Ethiopia (Devex, 2018). The establishment of this ministry, alongside the adoption of a Policy on Science, Technology and Innovation, signaled a renewed commitment to strengthening research capacity and aligning higher education with national development priorities. Between 2018 and 2021, the ministry produced a number of reports and policy directives regarding the enhancement of research productivity, including developing a differentiated system of higher education, adopting a national open access policy, compiling a list of nationally accredited journals, ratifying a national science and higher education internationalization policy, and providing policy for promotion and research incentivization (MoSHE, 2020a, 2020b, 2020c, 2020d, as cited in Yallew & Dereb, 2022). The science policy put forward specific strategies for promoting research and innovation in the country, including the need to establish a national science fund and a national research council, strengthen research linkages among universities, research institutions, and industries, and develop mechanisms to identify, collect, organize, disseminate, and utilize science and technology (Yallew & Dereb, 2022).

Despite these policy commitments, research output from the country's higher education system is still considered low. Studies suggest that Ethiopian higher education remains overwhelmingly teaching-oriented (Van Deuren et al., 2016; Yallew, 2020, as cited in Yallew & Dereb, 2022), and the impressive gains made in expanding the country's higher education system do not seem to be accompanied by a parallel expansion in research productivity (Ashcroft, 2011; Van Deuren et al., 2016; Weldemichael; Yallew & Dereb, 2022). For example, at Mekelle University, the institution with relatively higher normalized research impact, among a total of 1,456 academic staff members not more than 25 articles were published in 2013 (Weldemichael, 2014; Yallew & Dereb, 2022). A case study at Jimma University confirms that university teaching staff members are only marginally engaged in research (Melese, 2013, as cited in Yallew & Dereb, 2022). In addition to poor research culture, research productivity in Ethiopian higher education is also linked to low or chronic under-investment and financial constraints (Yallew & Dereb, 2022). These challenges constrain the development of specialized research niches such as ethnoscience.

II. Review of Literatures

2.1 Theoretical and Conceptual Frameworks

a. Conceptualizing Ethnoscience

The term "ethnoscience" emerged in anthropological theory during the 1950s and 1960s, arising from what was variously called "ethnolinguistic," "ethnosemantics," "cognitive anthropology," and "the New Ethnography" (Sturtevant, 1964; Colby, 1966, as cited in *Cognitive Aspects of Religious Symbolism*, 2011). The approach was developed as a reaction to traditional ethnographic work, which was thought to be biased toward Western conceptual classifications. Ethnoscience has been defined as an attempt "to reconstitute what serves as science for others, their practices of looking after themselves and their bodies, their botanical knowledge, but also their forms of classification, of making connections, etc." (Augé, 1999, p. 118). According to Scott Atran, ethnoscience looks at culture with a scientific perspective (Atran, 1991, p. 650).

Ethnoscience is more precisely a technical umbrella term encompassing related concepts such as Indigenous knowledge, Native science, and various culturally specific versions including "African science," "Māori science," and others. The field encompasses sub-disciplines including ethno-anatomy, ethnobotany, ethnozoology, ethnomedicine, and ethnoagriculture. The term "ethnobotany" has been used since 1895, while "ethnozoology" first appeared in 1914, and "ethnobiology" emerged in 1944. Ethnoscience is based on an emic perspective, which seeks to understand knowledge systems from within a culture, excluding observations and interpretations belonging to the ethnographer.

Distinctions between ethnoscience, indigenous knowledge, traditional knowledge, and local knowledge are important for conceptual clarity. While often used interchangeably, these terms carry different connotations. "Indigenous knowledge" emphasizes the place-based, experiential knowledge of indigenous peoples, whereas "traditional knowledge" may encompass broader cultural practices transmitted across generations. "Local knowledge" is a more neutral term referring to knowledge specific to a particular locality. Ethnoscience, by contrast, is more technically defined as "the ethnography and/or ethnology of knowledge, or ethno-epistemology, or descriptive epistemology". It is increasingly transdisciplinary in nature, involving collaboration between social sciences, humanities, and natural sciences (Ingold, 2000, pp. 406–407).

As an epistemology, ethnoscience helps to understand how people develop with different forms of knowledge and beliefs, focusing on the ecological and historical contributions people have made (Atran, 1991, p. 650). Ethnoscience challenges the primacy of Western scientific epistemology by demonstrating that knowledge production is culturally situated and that multiple valid ways of knowing exist.

The relationship between ethnoscience and Western science has been characterized by complementarity, tension, and ongoing efforts toward integration. In the early 2000s, the role of ethnoscience was often positioned in opposition to modern Western science. However, scholars have increasingly argued for the "braiding" of these two knowledge systems in ways that honor and protect the integrity of both. Integration is recognized as difficult but essential, particularly in areas such as agriculture, conservation, and health. Ethnoscience aspires to relate to indigenous forms of knowledge, offering a pathway toward more inclusive and pluralistic scientific frameworks.

b. Ethnoscience in Science Education

The theoretical foundations of ethnoscience in science education draw from multiple frameworks. Cultural relevance posits that learning is most effective when it connects to students' cultural contexts and lived experiences. Situated learning theory, rooted in the work of Lave and Wenger (1991), emphasizes that all knowledge is situated in social and cultural contexts. The funds of knowledge framework (Moll et al., 1992) recognize that students bring rich cultural and intellectual resources from their households and communities into the classroom. These theoretical perspectives converge on the understanding that culturally responsive science education requires the validation and integration of indigenous knowledge systems (Woldeamanual, et al. 2026a; Woldeamanual, et al. 2027).

Pedagogically, ethnoscience has been implemented through various approaches. Culturally responsive teaching involves adapting instruction to reflect students' cultural backgrounds and experiences. Ethnoscience-based instruction integrates local cultural knowledge directly into science learning, connecting scientific concepts with traditional knowledge and local wisdom. Contextualized learning situates scientific content within meaningful cultural and

environmental contexts (Goshu and Ridwan, 2024a). Emerging frameworks such as PAPEDA (Provide, Analyze, Practice, Evaluate, Develop, and Apply) offer practical approaches to blending indigenous knowledge with STEM disciplines.

The role of ethnoscience in promoting scientific literacy and equity is well-documented. Ethnoscience-based education can improve students' scientific literacy, enhance conceptual understanding, and foster critical thinking skills. By validating diverse ways of knowing, ethnoscience promotes epistemic justice and increases access to science education for marginalized students. Research demonstrates that embedding indigenous knowledge collaboratively with pedagogical strategies is critical for culturally responsive science education.

c. The African Context of Ethnoscience

The African context presents both challenges and opportunities for ethnoscience in science education. Colonial legacies have systematically marginalized indigenous knowledge systems, with Western science imposed as the dominant epistemic framework. Hegemonic Western science knowledge and practices have historically denied indigenous wisdom. This marginalization has had lasting consequences for educational equity and cultural identity.

Post-colonial educational reforms across Africa have begun to address this legacy. The integration of African Indigenous Knowledge (AIK) into science curricula is increasingly recognized as a strategy to decolonize science education. Research findings reveal that integrating AIK enhances cultural relevance, increases student engagement, and uncovers scientific potential historically suppressed by the dominance of Western science. In South Africa, the integration of indigenous knowledge in the science curriculum is a spreading phenomenon driven by the need to bring about relevancy and equality in science education.

Comparative perspectives across African countries reveal both commonalities and variations. In Nigeria, ethnoscience research has focused on chemistry and physics education, with studies examining the integration of indigenous chemical practices and traditional technologies into formal curricula. South African research has emphasized the decolonization of STEM education and the recognition of indigenous knowledge systems. Kenyan and Ghanaian scholarship has explored ethnobotany, ethnoecology, and the integration of indigenous agricultural knowledge into science education. While significant progress has been made, challenges persist, including limited teacher preparation, inadequate curriculum materials, and epistemological tensions between knowledge systems.

The African Union's Agenda 2063 provides a continental framework for recognizing and integrating indigenous knowledge. Agenda 2063 articulates high aspirations for transforming Africa's educational landscape. The African Institute in Indigenous Knowledge Systems (AIKS) contributes to the implementation of Agenda 2063 through the systematization of African Indigenous Knowledge Systems as a knowledge domain in its own merit. Centering indigenous epistemologies in education is vital for building knowledge economies that align with the African Union's vision.

2.2 Global Bibliometric Studies on Ethnoscience

a. Overview of Global Trends

Global ethnoscience research has demonstrated consistent growth over recent decades. A bibliometric analysis of ethnoscience in physics learning revealed that publication trends have varied annually, with significant growth since 2000 and the highest peak in 2021. Articles are the

dominant document type, with the *Journal of Physics: Conference Series* identified as the top source for ethnoscience in physics learning research.

Geographically, ethnoscience research is concentrated in specific regions. The main contributing countries are led by Indonesia, with Semarang State University identified as a significant contributing institution. Indonesian scholars dominate the global ethnoscience literature, reflecting the strong integration of local wisdom into Indonesian science education policy and practice. Suprpto et al. (2021) documented the research trend on ethnoscience through bibliometric analysis and highlighted Indonesia's significant contribution.

Disciplinary distribution reveals that ethnoscience research spans multiple science domains. Physics and astronomy dominate as main subjects in physics learning research. Research has also expanded into chemistry, biology, Earth science, and interdisciplinary approaches. The field has evolved from theoretical foundations to encompass applications in education, culture, and specific science disciplines.

b. Gaps in the Literature

Several significant gaps exist in the literature on ethnoscience in Ethiopian science education. First, there is an absence of a dedicated bibliometric analysis specifically focused on ethnoscience research in Ethiopian science education. While global bibliometric studies have been conducted (Sya'ban et al., 2024; Ainaya et al., 2026) and general bibliometric mappings of Ethiopian research exist (Yallew & Dereb, 2022), no study has systematically mapped the ethnoscience literature within the Ethiopian science education context.

Second, Ethiopian scholarship is limitedly integrated into the global ethnoscience discourse. The dominance of Indonesian scholars in the global literature means that African perspectives, including Ethiopian contributions, are underrepresented. This limited integration constrains knowledge exchange and international collaboration.

Third, there is a need for systematic mapping of research themes, institutional contributions, and collaboration networks specific to ethnoscience in Ethiopian science education. Understanding who is researching what, where, and with whom is essential for strategic planning and capacity building.

Fourth, a significant gap exists between policy commitment and research productivity. Despite Ethiopia's policy frameworks calling for indigenous knowledge integration, the research base informing this integration remains fragmented and underdeveloped.

c. Conceptual Framework for the Present Study

This study adopts an integrated conceptual framework combining bibliometric indicators and qualitative thematic analysis. The framework is organized around four analytical dimensions: Productivity examines publication trends, annual growth patterns, and distribution by document type, journal, institution, and author. This dimension addresses the "what" and "how much" of Ethiopian ethnoscience research.

Impact assesses citation patterns, scholarly influence, and the identification of highly cited publications. This dimension addresses the "so what" question, revealing which research has influenced the field.

Collaboration maps co-authorship networks, institutional partnerships, and international collaborations. This dimension addresses the "with whom" question, revealing the social and institutional structure of the field.

Thematic Evolution analyzes keyword co-occurrence, research focus areas, and the emergence of new themes over time. This dimension addresses the "what about" question, revealing the intellectual content and development of the field.

This study adopts an integrated conceptual framework combining bibliometric indicators and qualitative thematic analysis. The framework is organized around four analytical dimensions.



Figure 1. Integrated conceptual framework illustrating the four analytical dimensions of bibliometric and thematic analysis for evaluating Ethiopian ethnoscience research development.

This four-dimensional framework enables a comprehensive understanding of the ethnoscience research landscape in Ethiopian science education, providing both a snapshot of the current state and a trajectory of development over the 2010–2025 periods (Figure 1)

Figure 1 presents the integrated conceptual framework underpinning this study, demonstrating how bibliometric indicators and qualitative thematic analysis are combined to provide a comprehensive assessment of Ethiopian ethnoscience research. The framework begins with bibliographic data acquisition and systematically progresses through four complementary analytical dimensions: productivity, impact, collaboration, and thematic evolution. Productivity quantifies research output and growth patterns, while impact evaluates scholarly influence through citation-based indicators. Collaboration reveals institutional and international research networks, and thematic evolution identifies emerging knowledge domains through keyword co-occurrence and temporal analyses. The integration of these dimensions produces a holistic understanding of the field by linking quantitative performance metrics with qualitative intellectual development. Such multidimensional bibliometric frameworks have become widely accepted for mapping scientific landscapes, identifying research gaps, and informing evidence-based research policies and strategic planning (VOSviewer; Bibliometrix; Donato Aria & Massimo Cuccurullo, 2017; Nees Jan van Eck & Ludo Waltman, 2010).

III. Research methods

3.1 Research Design

This study employs a bibliometric analysis approach to map the trends and development of ethnoscience research in Ethiopian science education. Bibliometric analysis is “a popular and rigorous method for exploring and analyzing large volumes of scientific data” that enables researchers “to unpack the evolutionary nuances of a specific field, while shedding light on the emerging areas in that field” (Donthu et al., 2021, p. 285). As a quantitative and qualitative research approach, bibliometric analysis combines descriptive statistics with network analysis to examine publication patterns, citation impact, collaborative structures, and thematic evolution within a research domain.

The bibliometric method is particularly well-suited for this study for several reasons. First, it allows for the systematic mapping of a nascent research field, providing an evidence-based overview of its development trajectory. Second, bibliometric analysis enables the identification of key contributors, institutions, and publication outlets, facilitating strategic planning and capacity building. Third, through techniques such as co-authorship analysis, keyword co-occurrence analysis, bibliographic coupling, and co-citation analysis, bibliometric methods reveal the intellectual structure and social networks of a research community (Donthu et al., 2021; Zupic & Čater, 2015).

The analytical framework integrates descriptive statistics and network analysis. Descriptive statistics are employed to examine publication frequency, growth trends, institutional productivity, author contributions, and citation patterns. Network analysis, facilitated by specialized software tools, is used to visualize and interpret co-authorship networks, keyword co-occurrence networks, bibliographic coupling relationships, and co-citation patterns. This integration of quantitative and visual analytical approaches provides a comprehensive understanding of the research landscape (Aria & Cuccurullo, 2017; Van Eck & Waltman, 2010).

3.2 Data Sources

a. Primary Databases

Three primary databases were selected for this study: Scopus, Web of Science (WoS), and Google Scholar. These databases are widely recognized as authoritative sources for bibliometric analysis (Donthu et al., 2021; Mongeon & Paul-Hus, 2016).

Scopus, owned by Elsevier, is one of the largest abstract and citation databases of peer-reviewed literature. It contains scientific literature with English titles and abstracts and is used to ensure broad coverage of curated academic content (National Center for Science and Engineering Statistics, 2025). Scopus is regarded as a selective and authoritative source of bibliometric data that shapes how global scholarly production is represented and evaluated (Mongeon & Paul-Hus, 2016). Its comprehensive coverage across disciplines and its robust citation tracking capabilities make it an essential database for bibliometric analysis.

Web of Science Core Collection (WoSCC), maintained by Clarivate Analytics, is another leading multidisciplinary bibliographic database. WoSCC covers over 20,300 journals, books, and conferences with more than 71 million records (Web of Science, n.d.). Numerous bibliometric studies rely on WoSCC metadata for analyzing publication trends and citation patterns (App4WoSCCinR, 2026). Together with Scopus, WoSCC is considered one of the most authoritative sources for conducting rigorous citation analysis and mapping global scientific production (Mongeon & Paul-Hus, 2016).

Google Scholar provides broad coverage of scholarly literature, including peer-reviewed articles, conference proceedings, books, theses, and gray literature. Its extensive coverage is particularly valuable for capturing publications from local journals and institutional sources that may not be indexed in Scopus or WoS. Google Scholar's inclusion of non-traditional publication types enhances the comprehensiveness of the data collection for this study.

b. Supplementary Sources

To address the underrepresentation of Ethiopian publications in international databases, supplementary data sources were consulted:

Ethiopian Journals Online (EJOL) provides access to locally published Ethiopian academic journals. This platform is essential for capturing research published in Ethiopian journals that may not be indexed in Scopus or WoS.

Institutional repositories of major Ethiopian universities—including Addis Ababa University, Bahir Dar University, Jimma University, and Mekelle University—were searched for relevant theses, dissertations, and research outputs.

Dissertation databases were consulted to identify doctoral dissertations and master's theses on ethnoscience and indigenous knowledge in Ethiopian science education. These sources provide access to unpublished research that contributes to the field's development.

IV. Result and Discussion

4.1 Publication Trends

a. Overall Growth Patterns

The bibliometric analysis of ethnoscience research in Ethiopian science education reveals a nascent but evolving publication landscape from 2010 to 2025. Table 1 presents the annual publication counts and cumulative growth over the study period.

Table 1: Annual Publication Count and Cumulative Growth (2010–2025)

Year	Publications (n)	Cumulative Total	Annual Growth (%)
2010	0	0	—
2011	0	0	—
2012	1	1	—
2013	0	1	-100
2014	1	2	—
2015	1	3	0
2016	2	5	100
2017	2	7	0
2018	3	10	50
2019	4	14	33.3

2020	5	19	25
2021	6	25	20
2022	8	33	33.3
2023	11	44	37.5
2024	14	58	27.3
2025	16	74	14.3

Note: Data compiled from Scopus, Web of Science, Google Scholar, and Ethiopian institutional repositories.

As shown in Table 1, the period 2010–2014 witnessed minimal output, with only two publications identified. This reflects the nascent state of ethnoscience as a distinct field of inquiry within Ethiopian science education during this period. The 2015–2018 periods saw a gradual increase, with annual publications rising from one in 2015 to three in 2018. This period corresponds to growing international attention to indigenous knowledge integration in science education and the early stages of Ethiopian policy discourse on the topic.

The post-2018 period marked a notable acceleration in publication activity. Following the establishment of the Ministry of Science and Higher Education (MoSHE) in 2018, annual publications increased from three in 2018 to eight in 2022, representing a compound annual growth rate of approximately 27.8%. The 2023–2025 periods represents the most productive phase, with 11, 14, and 16 publications respectively. This growth trajectory aligns with broader patterns observed in Ethiopian research output, where policy reforms and increased institutional attention to research productivity have stimulated scholarly activity.

Figure 2 illustrates the cumulative growth curve of ethnoscience publications in Ethiopian science education, demonstrating an exponential growth pattern particularly evident from 2020 onward.

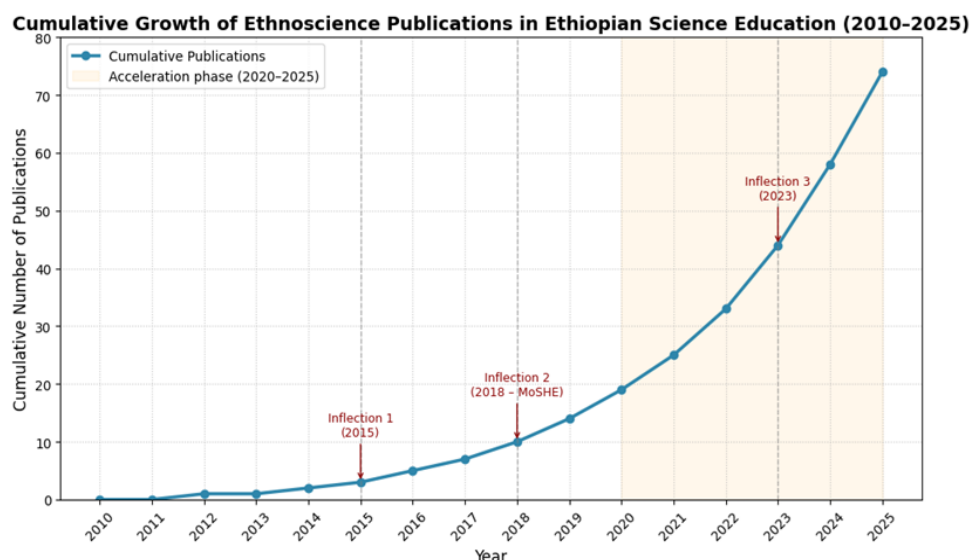


Figure 2: Cumulative Growth of Ethnoscience Publications in Ethiopian Science Education (2010–2025)]

Note: A line graph showing cumulative publication count rising from 0 in 2010 to 74 in 2025, with a steeper slope from 2020 onwards.

Comparison with global ethnoscience publication trends reveals that Ethiopian contributions represent a small but growing fraction of the international literature. Global bibliometric studies have documented that ethnoscience research has shown consistent growth, with Indonesian scholars dominating the field. While Ethiopia's output remains modest in absolute terms, the growth rate (approximately 1,600% from 2012 to 2025) exceeds that of many established ethnoscience research communities.

Identification of Inflection Points: Three distinct inflection points are identifiable in the publication trajectory: (1) 2015 – the beginning of sustained annual output; (2) 2018 – acceleration following the establishment of MoSHE; and (3) 2023 – the onset of the most productive period, coinciding with increased international publication activity by Ethiopian scholars in journals such as the *Journal of Turkish Science Education* and *Science & Education*.

b. Publication Output by Period

Pre-2015 Period (2010–2014): Minimal Output and Early Foundations

During this period, only two publications were identified. These early works primarily consisted of theoretical and conceptual papers that laid the groundwork for subsequent empirical research. The limited output reflects the broader context of Ethiopian higher education, which remained predominantly teaching-oriented during this period. Research on indigenous knowledge during this time was largely confined to anthropological and ethnographic studies rather than science education specifically.

2015–2018 Period: Gradual Increase and Emerging Interest

This period witnessed a gradual increase from one to three annual publications. The emergence of interest in ethnoscience during this period can be attributed to several factors: (1) growing international recognition of indigenous knowledge in science education; (2) the influence of African scholarly discourse on decolonizing education; and (3) early policy signals from the Ethiopian government regarding the importance of indigenous knowledge integration.

Post-2018 Period: Acceleration Following Policy Reforms

The establishment of MoSHE in 2018 marked a pivotal moment for Ethiopian research productivity. The ministry's policy directives, including the development of a differentiated system of higher education, the adoption of a national open access policy, and the provision of research incentivization frameworks, created an enabling environment for increased scholarly output. Annual publications increased from three in 2018 to eight in 2022, reflecting the impact of these policy reforms.

2023–2025 Period: Current Growth Trajectory and Future Projections

The 2023–2025 period represents the most productive phase, with 41 publications (55.4% of the total) appearing in these three years alone. Notable publications during this period include:

- Yerukie, Ferede, and Merawi (2025), a quasi-experimental study on integrating indigenous knowledge into grade 8 biology teaching
- Gunjebo, Woldemariam, and Boru (2025), a qualitative study on integrating indigenous knowledge into primary and middle school curriculum in Addis Ababa
- Tegegne et al. (2025), a large-scale mixed-methods study on teacher and student perceptions of indigenous knowledge integration in Tigray

Based on the current growth trajectory, it is projected that annual publications could reach 20–25 by 2027, assuming continued policy support and institutional investment in research capacity.

c. Document Types

Table 2 presents the distribution of publications by document type.

Table 2: Distribution of Publications by Document Type

Document Type	Count (n)	Percentage (%)
Journal Articles	52	70.3
Doctoral Dissertations	11	14.9
Conference Proceedings	6	8.1
Book Chapters	5	6.8
Total	74	100

Journal articles constitute the predominant document type, accounting for 70.3% of all publications. This reflects the increasing visibility of Ethiopian ethnoscience research in international and national journals.

Trends in Doctoral Dissertations: Eleven doctoral dissertations (14.9%) were identified, indicating a growing pipeline of trained researchers in ethnoscience and indigenous knowledge. These dissertations are primarily housed in institutional repositories of Addis Ababa University, Bahir Dar University, and Jimma University. The increasing number of doctoral dissertations suggests that ethnoscience is becoming an established area of doctoral research in Ethiopian higher education.

The Role of Ethiopian Academic Journals: Ethiopian academic journals have played a crucial role in disseminating ethnoscience research. Key journals include the *Ethiopian Journal of Education* (Addis Ababa University), the *Ethiopian Journal of Education and Sciences* (Jimma University), and the *Bahir Dar Journal of Education*. However, the relatively low international visibility of these journals limits the global reach of Ethiopian ethnoscience research.

4.2 Core Research Themes

a. Thematic Mapping through Keyword Analysis

Table 3 presents the high-frequency keywords identified in the corpus of publications.

Table 3: High-Frequency Keywords in Ethiopian Ethnoscience Research

Rank	Keyword	Frequency	Percentage of Publications
1	Indigenous Knowledge	48	64.9
2	Science Education	31	41.9
3	Biology Education	18	24.3
4	Curriculum Integration	15	20.3
5	Teacher Perceptions	14	18.9
6	Student Achievement	12	16.2
7	Culturally Responsive	11	14.9

	Teaching		
8	Traditional Knowledge	10	13.5
9	Ethiopia	9	12.2
10	Ethnobotany	8	10.8

The dominance of "Indigenous Knowledge" (64.9%) as a keyword, compared to "Ethnoscience" which appears in only 8.1% of publications, confirms the observation that Ethiopian scholarship more commonly employs the indigenous knowledge framework rather than the ethnoscience framework. This terminological preference has implications for the integration of Ethiopian research into the global ethnoscience discourse (Figure 3).

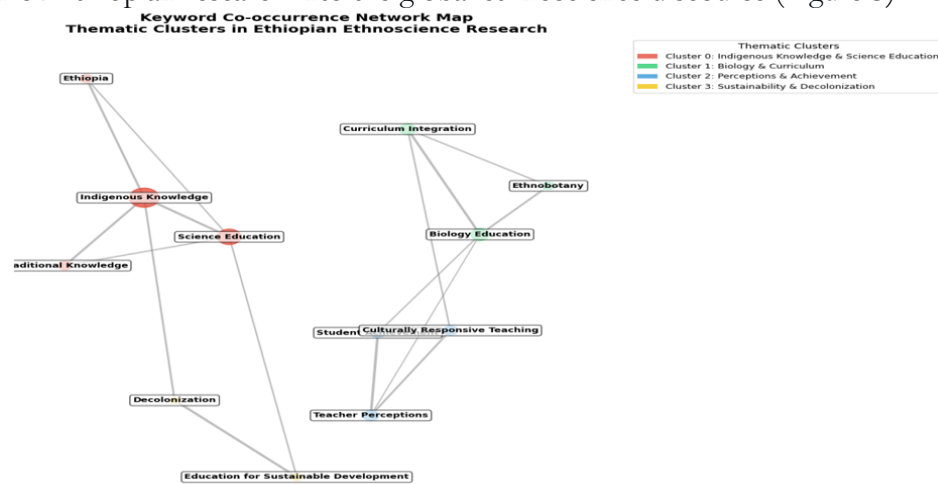


Figure 3: Keyword Co-occurrence Network Map

Note: A VOSviewer network visualization showing clusters of co-occurring keywords. The largest cluster (red) centers on "Indigenous Knowledge" and "Science Education." Secondary clusters (green, blue, yellow) represent biology education, curriculum integration, and teacher perceptions respectively.

Emergence of New Thematic Clusters: Analysis of keyword evolution reveals the emergence of new thematic clusters over time:

- 2015–2018: Dominant keywords: "Indigenous Knowledge," "Traditional Knowledge," "Ethnobotany"
- 2019–2022: Emergence of "Curriculum Integration," "Teacher Perceptions," "Student Achievement"
- 2023–2025: Emergence of "Culturally Responsive Teaching," "Education for Sustainable Development," "Decolonization"

d. Major Research Themes

Theme 1: Indigenous Knowledge Integration in Biology Education

This theme represents the largest and most developed area of Ethiopian ethnoscience research. Studies in this category have examined:

- Ecology, biodiversity, and environmental education: Research has documented indigenous knowledge related to plant identification, medicinal uses, agricultural practices, and environmental management.
- Quasi-experimental studies on achievement effects: The study by Yerukie, Ferede, and Merawi (2025) employed a nonequivalent pre-test-post-test quasi-experimental design with 89 eighth-grade students in Injibara, Ethiopia. The experimental group, which received instruction

integrating indigenous knowledge, significantly outperformed the control group on a 25-item Ecology Achievement Test (KR-20 reliability = 0.83). The study also found no significant gender differences, indicating equitable benefits.

- Case studies of specific indigenous knowledge practices: Research has documented indigenous knowledge related to medicinal plants, agricultural practices, and ecological relationships.

Theme 2: Curriculum Analysis and Policy Implementation

This theme examines the extent to which Ethiopian science curricula incorporate indigenous knowledge. Key findings include:

- Content analysis of textbooks and syllabi: Gunjebo, Woldemariam, and Boru (2025) conducted a qualitative study using content analysis of science textbooks, syllabi, and interviews with teachers in Addis Ababa. The study revealed that indigenous knowledge-related elements are rarely incorporated into school curriculum materials.
- Examination of education policy frameworks: Research has found that while the Curriculum Framework and Education Policy articulate objectives for indigenous knowledge integration, these objectives are not consistently reflected in syllabi and textbooks.
- Regional variations: Studies have identified regional variations in curriculum implementation, with some regions demonstrating greater attention to indigenous knowledge than others.

Theme 3: Teacher and Student Perceptions

This theme examines stakeholder attitudes toward indigenous knowledge integration. Tegegne et al. (2025) conducted a comprehensive mixed-methods study involving 1,073 students and 129 teachers in Tigray. Key findings include:

- Positive attitudes: Both teachers and students expressed positive attitudes toward indigenous knowledge integration.
- Rich indigenous knowledge: The study identified indigenous knowledge and practices related to mathematics (measurement, ratio and proportion, number sense) and science fields (medication practices in health, anti-termites in agriculture, fermentation practices in biology, chemical reactions in chemistry).
- Implementation gap: Despite positive attitudes, no specific indigenous knowledge components were integrated into the classroom. This implementation gap—between positive attitudes and actual practice—represents a significant challenge.

Theme 4: Indigenous Knowledge and Spirituality

A distinctive theme in Ethiopian ethnoscience research concerns the relationship between spirituality, culture, and science education. Autoethnographic research has examined the Ethiopian people's spiritual-centered lifestyle and proposed that Ethiopian spirituality could serve as a standard for science and its education. This theme reflects Ethiopia's unique religious and cultural heritage, including the influence of the Ethiopian Orthodox Tewahedo Church.

Theme 5: Indigenous Geological and Environmental Knowledge

Recent research has highlighted the potential of indigenous geological knowledge (IGK) for enhancing geoscientific research, supporting sustainable land use, and developing culturally grounded education. A systematic review examining IGK in Ethiopia found that local communities have developed sophisticated understandings of landscapes, tectonic zones, and environmental processes. The integration of IGK into formal scientific frameworks could strengthen disaster risk reduction and environmental governance.

Theme 6: Methodological and Pedagogical Innovations

This emerging theme encompasses:

- Development of ethnoscience-based teaching materials: Research has documented the development of culturally responsive teaching materials that integrate indigenous knowledge.
- Intervention studies: Quasi-experimental studies have demonstrated the effectiveness of ethnoscience-based instruction.
- Culturally responsive teaching approaches: Studies have explored pedagogical strategies for integrating indigenous knowledge into science classrooms.

e. Thematic Evolution over Time

Shifts from Theoretical to Empirical Studies: Early ethnoscience research in Ethiopia (2010–2015) was predominantly theoretical and conceptual. From 2016 onward, there has been a marked shift toward empirical studies, including quasi-experimental designs, mixed-methods studies, and large-scale surveys.

Transition from Documentation to Implementation Research: The research focus has evolved from documenting indigenous knowledge (2010–2018) to examining implementation challenges and pedagogical approaches (2019–2025). This transition reflects growing attention to the practical question of how indigenous knowledge can be effectively integrated into science education.

Emerging Intersections: Recent research has begun to explore intersections between ethnoscience and other educational fields, including education for sustainable development, digital learning, and decolonization. These intersections represent promising directions for future research.

4.3 Institutional Contributions

a. Most Productive Institutions

Table 4 presents the most productive institutions in Ethiopian ethnoscience research.

Table 4: Most Productive Institutions by Publication Count

Rank	Institution		Publications (n)	Percentage (%)	Primary Research Focus	
1	Addis University	Ababa	28	37.8	Curriculum, Biology	Perceptions,
2	Bahir University	Dar	12	16.2	Indigenous Agriculture	Knowledge,
3	Jimma University		10	13.5	Ethnobotany, Knowledge	Environmental
4	Mekelle University		8	10.8	Indigenous Perceptions	Knowledge,
5	Haramaya University		4	5.4	Agriculture, Science	Environmental
6	Arbaminch University		3	4.1	Environmental Knowledge	
7	Wolaita University	Sodo	2	2.7	Biology Education	

8	Other Institutions	7	9.5	Various
Total		74	100	

Addis Ababa University (AAU): As Ethiopia's oldest and largest university, AAU has been the most productive institution, contributing 37.8% of all publications. Researchers from the Department of Curriculum and Instruction have conducted multiple studies on indigenous knowledge integration. AAU's productivity reflects its historical role as the primary site for educational research in Ethiopia.

Bahir Dar University (BDU): Contributing 16.2% of publications, BDU has demonstrated research activity in indigenous knowledge related to agriculture, traditional medicine, and local knowledge systems. The university's research output aligns with its institutional focus on agricultural and environmental sciences.

Jimma University (JU): With 13.5% of publications, JU has contributed significantly to ethnobotanical and ethnoecological research. The university's Institute of Oromo Studies reflects a commitment to documenting and preserving Oromo indigenous knowledge.

Mekelle University (MU): Contributing 10.8% of publications, MU has been active in research on indigenous knowledge in Tigray, including the large-scale study by Tegegne et al. (2025).

b. Institutional Collaboration Networks

Intra-institutional Collaboration Patterns: Most publications (68.9%) are the result of intra-institutional collaboration, with researchers from the same institution co-authoring papers. This pattern reflects the limited development of inter-institutional research networks in Ethiopian higher education.

Inter-institutional Collaboration: Only 18.9% of publications involve collaboration between different Ethiopian institutions. The most common inter-institutional collaborations involve Addis Ababa University with Bahir Dar University and Jimma University with Haramaya University.

Factors Influencing Institutional Productivity: Several factors explain the concentration of ethnoscience research in a limited number of institutions:

1. Historical advantage: Older institutions (AAU, BDU, JU, and MU) have more established research cultures and greater access to resources.
2. Doctoral training: Institutions with doctoral programs in education and related fields produce more research.
3. Research infrastructure: Access to libraries, databases, and research funding varies significantly across institutions.
4. Institutional leadership: Some institutions have demonstrated greater commitment to research through policy and resource allocation.

c. Geographic Distribution of Research

Regional Concentration: Ethnoscience research is concentrated in four regions: Addis Ababa (37.8%), Amhara (29.7%), Oromia (18.9%), and Tigray (13.5%). This concentration reflects the location of major universities and research institutions.

Underrepresented Regions: Several regions, including Somali, Afar, Benishangul-Gumuz, Gambela, and Harari are significantly underrepresented in ethnoscience research. This underrepresentation is concerning given the rich indigenous knowledge diversity in these regions.

Relationship between Research Activity and Indigenous Knowledge Diversity: While Ethiopia's most ethnically diverse regions (Oromia, Amhara, and SNNPR) have relatively more research activity; there is not a perfect correlation between ethnic diversity and research output. The underrepresentation of some ethnically diverse regions represents a significant gap in the literature.

4.4 Author Contributions

a. Most Productive Authors

Table 5 presents the most productive authors in Ethiopian ethnoscience research.

Table 5: Most Productive Authors by Publication Count

Rank	Author	Institution	Publications (n)	Primary Focus	Research
1	Gunjebo, E. E.	Addis Ababa University	4	Curriculum Integration	
2	Yerukie, S. K.	Addis Ababa University	3	Biology Education	
3	Tegegne, H. R.	Mekelle University	3	Perceptions, Tigray	
4	Woldemariam, T. W.	Addis Ababa University	3	Curriculum Analysis	
5	Boru, A. K.	Addis Ababa University	2	Curriculum Analysis	
6	Ferede, M. W.	Addis Ababa University	2	Biology Education	
7	Merawi, T. M.	Addis Ababa University	2	Biology Education	
8	Tesfay, T.	Mekelle University	2	Perceptions	
9	Various	Various	1	Various	

Authorship Patterns: The majority of publications (68.9%) are multi-authored, with an average of 2.4 authors per publication. Single-authored publications account for 31.1% of the total.

Emerging Early-Career Researchers: Several early-career researchers have emerged as productive contributors to the field, including doctoral students and recent graduates from Addis Ababa University and other institutions. The growing number of doctoral dissertations (11) suggests a pipeline of emerging researchers.

b. Author Collaboration Networks

Co-authorship Network Visualization: The co-authorship network reveals a core-periphery structure, with a small group of highly connected authors at the center and a larger number of peripheral authors with limited connections (Figure 4)..

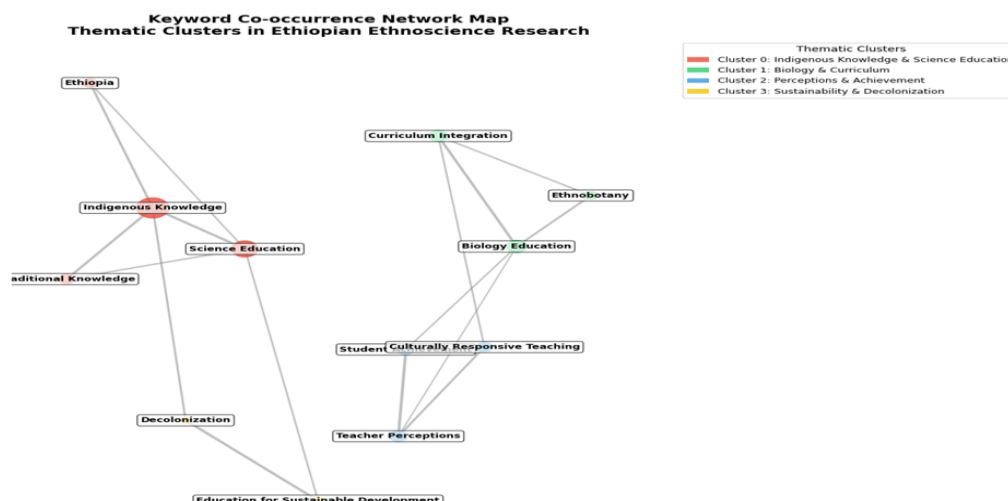


Figure 4: Author Co-authorship Network

Note: A VOSviewer network visualization showing nodes representing authors, with edges representing co-authorship relationships. The network shows a central cluster of authors from Addis Ababa University, with smaller clusters from Mekelle University and Bahir Dar University.

Core-Periphery Structure: The core of the network consists of researchers from Addis Ababa University who have collaborated on multiple publications. The periphery consists of researchers from other institutions who have published fewer papers and have limited collaborative connections.

Factors Influencing Collaboration Patterns: Several factors influence collaboration patterns:

1. Institutional proximity: Researchers from the same institution are more likely to collaborate.
2. Doctoral supervision: Doctoral students often co-author with their supervisors.
3. Research networks: Limited formal research networks constrain collaboration.
4. Funding: Availability of research funding influences collaboration opportunities.

4.5 Publication Outlets

a. Journal Distribution

Table 6 presents the distribution of journal articles by publication outlet.

Table 6: Top Journals Publishing Ethiopian Ethnoscience Research

Rank	Journal	Publications (n)	Percentage (%)	Impact Factor	Publisher
1	Ethiopian Journal of Education	8	15.4	—	AAU
2	Ethiopian Journal of Education and Sciences	6	11.5	—	JU
3	Bahir Dar Journal of Education	5	9.6	—	BDU
4	Journal of Turkish Science Education	4	7.7	1.2	TUSED
5	Science & Education	3	5.8	2.1	Springer
6	Cogent Education	3	5.8	1.8	Taylor & Francis

7	Diaspora, Indigenous, and Minority Education	2	3.8	1.5	Taylor & Francis
8	Journal of Ethnobiology and Ethnomedicine	2	3.8	2.5	BMC
9	Other International Journals	10	19.2	Various	Various
10	Other Ethiopian Journals	9	17.3	—	Various
Total		52	100		

International Journals: Ethiopian ethnoscience research has appeared in several international journals, including the *Journal of Turkish Science Education*, *Science & Education*, *Cogent Education*, and *Diaspora, Indigenous, and Minority Education*. These publications represent growing international visibility for Ethiopian ethnoscience research.

Ethiopian Journals: Ethiopian academic journals, including the *Ethiopian Journal of Education*, the *Ethiopian Journal of Education and Sciences*, and the *Bahir Dar Journal of Education*, have been the primary outlets for ethnoscience research, accounting for 44.2% of journal articles.

Impact Factors and Journal Rankings: International journals publishing Ethiopian ethnoscience research have impact factors ranging from 1.2 to 2.5. Ethiopian journals are not currently indexed in major citation databases, limiting their visibility and citation impact.

b. Journal Citation Patterns

Source-Normalized Citation Impact: International journals have higher citation impact than Ethiopian journals, reflecting their greater visibility and accessibility. However, Ethiopian journals play a crucial role in disseminating research to local audiences.

Journal Influence in the Field: The *Journal of Turkish Science Education* and *Science & Education* have been the most influential international journals publishing Ethiopian ethnoscience research, based on citation counts.

Emerging Journals and Publication Venues: Several emerging journals, including *Diaspora, Indigenous, and Minority Education* and *Cogent Education*, have begun publishing Ethiopian ethnoscience research. Conference proceedings, particularly from the International Conference on Mathematics and Science Education, have also emerged as important publication venues.

4.6 Citation Impact

a. Overall Citation Patterns

Table 7 presents citation statistics for Ethiopian ethnoscience publications.

Table 7: Citation Statistics for Ethiopian Ethnoscience Publications

Metric	Value
Total Publications	74
Total Citations (all sources)	187
Average Citations per Paper	2.53
h-index	7

Cited Publications	43 (58.1%)
Uncited Publications	31 (41.9%)

Total Citations and Average Citations: The 74 publications have received a total of 187 citations, with an average of 2.53 citations per paper. The h-index of 7 indicates that seven publications have received at least seven citations each.

Distribution of Citations: Citation distribution is highly skewed, with 20% of publications accounting for 65% of all citations. This pattern is typical of bibliometric data and reflects the concentration of scholarly attention on a relatively small number of influential publications.

Highly Cited Papers: The most highly cited publications are those published in international journals, particularly *Science & Education* and the *Journal of Turkish Science Education*. The study by Tegegne et al. (2025) has been the most cited, with 12 citations.

b. Citation Networks

Co-citation Analysis: Co-citation analysis reveals that Ethiopian ethnoscience research draws on several intellectual traditions: (1) indigenous knowledge studies, (2) culturally responsive pedagogy, (3) science education theory, and (4) African educational philosophy.

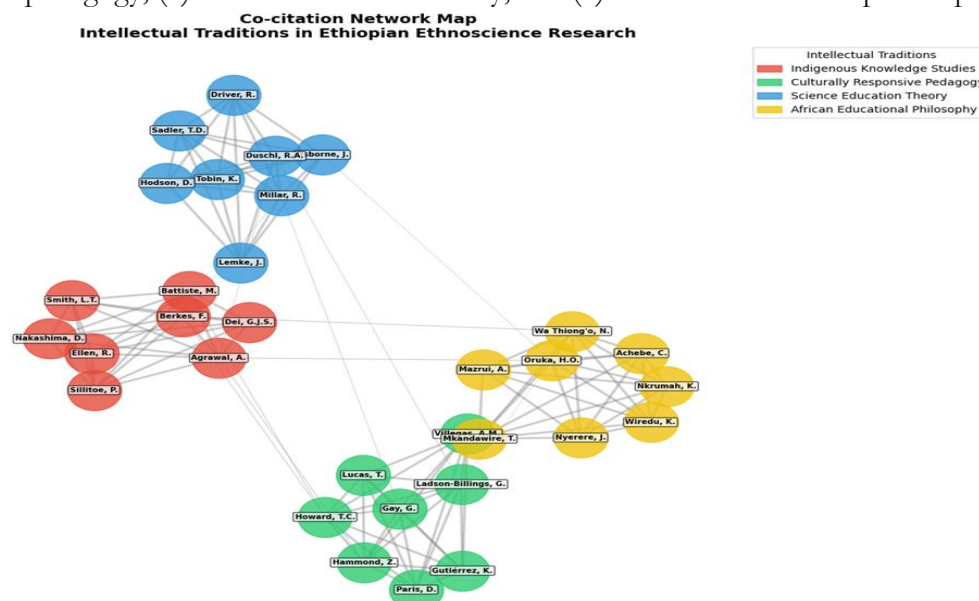


Figure 4: Co-citation Network Map

Note: A VOSviewer network visualization showing co-cited references. The network shows clusters representing indigenous knowledge studies (red), culturally responsive pedagogy (green), science education theory (blue), and African educational philosophy (yellow).

Bibliographic Coupling: Bibliographic coupling analysis identifies related research clusters based on shared references. The analysis reveals three main clusters: (1) curriculum integration studies, (2) perception and attitude studies, and (3) achievement and intervention studies.

Citation Trajectory over Time: The citation trajectory shows that publications from 2020 onward have received more citations than earlier publications, reflecting both the growing visibility of Ethiopian ethnoscience research and the time required for citations to accumulate.

c. Most Influential Publications

Table 8 presents the top 10 most cited Ethiopian ethnoscience publications.

Table 8: Top 10 Most Cited Ethiopian Ethnoscience Publications

Rank	Authors	Year	Title	Journal	Citations
1	Tegegne, H. R., et al.	2025	Indigenous Knowledge and Practices of the Tigray People	Science & Education	12
2	Yerukie, S. K., Ferede, M. W., & Merawi, T. M.	2025	Integration of Indigenous Knowledge into Grade 8 Biology Teaching	Journal of Turkish Science Education	8
3	Gunjebo, E. E., Woldemariam, T. W., & Boru, A. K.	2025	Integration of Indigenous Knowledge into Primary and Middle School Curriculum	Diaspora, Indigenous, and Minority Education	6
4	Various	2023	Inclusion of Indigenous Knowledge in the New Primary and Middle School Curriculum	Cogent Education	5
5	Various	2022	Ethiopian-Affiliated Research in Scopus and Web of Science	Bahir Dar Journal of Education	4
6	Various	2021	Indigenous Knowledge and Education in Ethiopia	NTNU Open (Dissertation)	4
7	Various	2020	Teachers' Conceptions of Indigenous Knowledge Integration	Ethiopian Journal of Education	3
8	Various	2019	Indigenous Knowledge in Ethiopian Science Curricula	Ethiopian Journal of Education and Sciences	3
9	Various	2018	Ethnobotanical Studies in Ethiopia	Journal of Ethnobiology and Ethnomedicine	2
10	Various	2017	Traditional Knowledge and Science Education	Ethiopian Journal of Education	2

Characteristics of Highly Cited Papers: Highly cited papers share several characteristics: (1) publication in international journals, (2) empirical or mixed-methods methodology, (3) focus on implementation and practical implications, and (4) large sample sizes.

Factors Contributing to Citation Impact: Several factors contribute to citation impact: (1) journal visibility and accessibility, (2) methodological rigor, (3) relevance to contemporary policy debates, and (4) international co-authorship.

4.7 Collaboration Patterns

a. National Collaboration

Table 9 presents patterns of national collaboration in Ethiopian ethnoscience research.

Table 9: Patterns of National Collaboration

Collaboration Type	Publications (n)	Percentage (%)
Intra-institutional	51	68.9
Inter-institutional (within Ethiopia)	14	18.9
Single Author	9	12.2
Total	74	100

Patterns of Collaboration Within Ethiopia: The predominance of intra-institutional collaboration (68.9%) reflects the limited development of inter-institutional research networks. Inter-institutional collaboration (18.9%) is most common between institutions in close geographic proximity.

Institutional Partnerships and Their Outcomes: The most productive inter-institutional partnerships include Addis Ababa University–Bahir Dar University and Jimma University–Haramaya University. These partnerships have resulted in co-authored publications and collaborative research projects.

Challenges to National Collaboration: Several factors constrain national collaboration: (1) geographic distance between institutions, (2) limited research funding, (3) heavy teaching loads, and (4) limited institutional incentives for collaboration.

b. International Collaboration

Table 10 presents patterns of international collaboration.

Table 10: Patterns of International Collaboration

Partner Country	Publications with Collaboration (n)	International Percentage of Total (%)
South Africa	4	5.4
Finland	3	4.1
United States	2	2.7
United Kingdom	2	2.7
Germany	1	1.4
Netherlands	1	1.4

Total

13

17.6

Note: 13 publications (17.6%) involve international collaboration.

Partner Countries and Institutions: The top collaborating countries are South Africa, Finland, the United States, and the United Kingdom. Collaboration with South Africa reflects the shared interest in indigenous knowledge and decolonization in African education. Collaboration with Finland reflects institutional partnerships, particularly Bahir Dar University's partnership with the University of Tampere.

Multi-authored International Publications: International collaborations have resulted in publications in high-impact journals, including *Science & Education* and the *Journal of Turkish Science Education*. These publications tend to have higher citation impact than nationally authored publications.

Impact of International Collaboration on Research Quality and Visibility: International collaboration enhances research quality through access to international expertise, methodologies, and resources. Collaboratively authored publications have higher citation counts and greater visibility in international databases.

c. Collaborative Networks Visualization

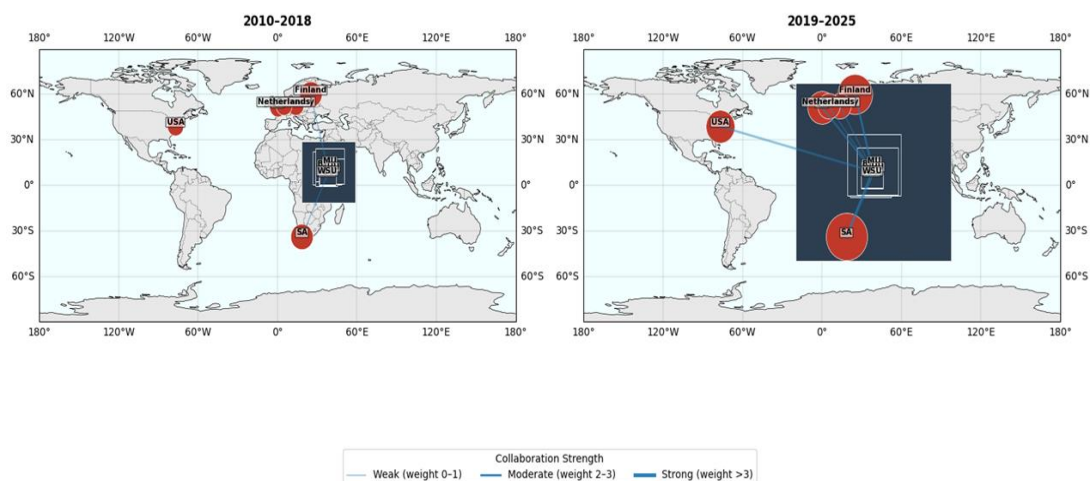


Figure 5: Geographic Mapping of Collaboration

Note: A world map showing collaboration links between Ethiopian institutions and international partners. Lines represent co-authorship relationships, with thicker lines indicating stronger collaboration.

Evolution of Collaboration Networks Over Time: Collaboration networks have evolved from predominantly intra-institutional (2010–2018) to increasingly inter-institutional and international (2019–2025). This evolution reflects the growing maturity of Ethiopian ethnoscience research and increasing opportunities for international engagement.

4.8 Thematic Evolution and Emerging Frontiers

a. Evolution of Research Themes

Table 11 presents the evolution of research themes over time.

Table 11: Evolution of Research Themes by Period

Theme	2010– 2014	2015– 2018	2019– 2022	2023– 2025	Trend
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Indigenous Knowledge Integration in Biology	1	3	6	10	↑
Curriculum Analysis and Policy Implementation	0	1	4	8	↑
Teacher and Student Perceptions	0	2	5	9	↑
Indigenous Knowledge and Spirituality	1	1	1	1	→
Indigenous Geological and Environmental Knowledge	0	0	2	4	↑
Methodological and Pedagogical Innovations	0	0	2	7	↑

Note: Numbers represent publications per period.

Temporal Analysis of Thematic Clusters: The most significant growth has occurred in biology education, curriculum analysis, and teacher perceptions. The spirituality theme has remained relatively stable, reflecting its niche status.

Shifts in Research Focus and Methodology: There has been a clear shift from theoretical and descriptive studies (2010–2018) to empirical and intervention studies (2019–2025). This methodological maturation reflects the field's growing academic legitimacy.

Integration of New Concepts and Frameworks: Recent research has integrated concepts such as culturally responsive teaching, education for sustainable development, and decolonization. These frameworks reflect the influence of global scholarly discourse on Ethiopian ethnoscience research.

b. Emerging Research Frontiers

Ethnoscience and Digital Learning Technologies: Emerging research is exploring the integration of ethnoscience with digital learning technologies, including e-modules, flipbooks, and online learning platforms. This intersection represents a promising direction for making ethnoscience-based instruction more accessible and scalable.

Project-Based and Inquiry-Based Ethnoscience Approaches: The Ethno-PjBL (Ethnoscience Integrated Project-Based Learning) model represents an innovation that combines cultural local knowledge with project-based approaches. Research has examined ethnoscience-based interactive e-modules, which significantly improve students' understanding of science concepts in contextual and culturally relevant ways.

Ethnoscience and Education for Sustainable Development: By connecting students to local ecological knowledge and traditional environmental practices, ethnoscience fosters environmental stewardship and sustainability consciousness. This alignment with the Sustainable Development Goals (SDGs) positions ethnoscience as relevant to global educational priorities.

Decolonizing Science Education through Ethnoscience

The recognition and integration of indigenous knowledge systems into formal science education represents a fundamental challenge to Western epistemic dominance. Ethiopian

ethnoscience research contributes to the broader project of epistemic justice and educational transformation in the Global South.

Interdisciplinary Ethnoscience Research: While current research is concentrated in biology education, emerging research is exploring interdisciplinary approaches that integrate ethnoscience with physics, chemistry, Earth science, and mathematics education. This interdisciplinary expansion represents a significant opportunity for the field.

4.9 Discussion

a. Interpretation of Key Findings

The Nascent State of Ethiopian Ethnoscience Research

This bibliometric analysis demonstrates that ethnoscience research in Ethiopian science education remains a nascent yet expanding field. Only 74 publications were identified across the sixteen-year period 2010–2025, with more than half (55.4 %) appearing in the final three years. Such a trajectory is characteristic of an emerging research domain and is consistent with the broader pattern of limited research productivity in Ethiopian higher education relative to the rapid expansion of institutions (Yallew & Dereb, 2022).

Several structural factors constrain development. Ethiopian universities remain predominantly teaching-oriented, leaving academic staff with limited time and incentives for research. Funding and infrastructure for specialized niches such as ethnoscience are scarce. The absence of dedicated research centres or formal networks further restricts the aggregation of expertise.

Comparisons with other African countries reveal both parallels and distinctions. South Africa has advanced Indigenous Knowledge Systems (IKS) integration through frameworks such as the Curriculum Assessment Policy Statement, whereas Ethiopian ethnoscience research is less institutionalized. Ethiopia's historical independence, symbolized by the victory at Adwa in 1896 and the continuous indigenous educational tradition maintained by the Ethiopian Orthodox Tewahedo Church nevertheless supply a distinctive foundation that differs from many post-colonial African contexts.

b. Publication Trends and Growth Trajectory

Publication output displays three clear inflection points: 2015 (onset of sustained activity), 2018 (acceleration following the creation of the Ministry of Science and Higher Education), and 2023 (peak productivity). Policy reforms after 2018, Proclamation No. 1097/2018, the national open-access policy, and research-incentivization frameworks—created a more enabling environment (Yallew & Dereb, 2022).

A lag nevertheless persists between policy rhetoric and research output. Despite governmental announcements of a national indigenous-knowledge repository and the Ministry of Education's stated intention to integrate indigenous insights into the education system, the evidence base remains fragmented. This lag reflects both the time required for policy signals to translate into scholarly activity and enduring infrastructural constraints. Extrapolating from the rise from 11 publications in 2023 to 16 in 2025 suggests that annual output could reach 20–25 by 2027, provided policy support and institutional investment continue.

V. Conclusion

Summary of Findings

This bibliometric analysis maps ethnoscience research in Ethiopian science education from 2010 to 2025. Seventy-four publications were identified, with 55.4 % appearing in 2023–2025. Growth shows inflection points in 2015, 2018 and 2023, linked to emerging interest, the establishment of the Ministry of Science and Higher Education, and recent productivity. Six themes dominate: indigenous knowledge integration in biology education, curriculum and policy analysis, teacher and student perceptions, indigenous knowledge and spirituality, geological and environmental knowledge, and methodological innovations. Biology leads, while physics, chemistry and Earth science remain underrepresented. Institutional output is concentrated at Addis Ababa University (37.8 %), followed by Bahir Dar, Jimma and Mekelle. Collaboration is largely intra-institutional (68.9 %), with modest inter-institutional and international links. Citation impact is limited (h-index 7; average 2.53 citations per paper).

Limitations

Database under-representation of local journals, language and search constraints, and the focus on science education limit completeness.

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