

Research on ethnoscience-based student worksheets to strengthen 21st-Century skills: A systematic literature review

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ABSTRACT

21st-century science learning requires the development of critical thinking skills; however, students' mastery of these skills remains relatively low, making innovations such as Electronic Student Worksheet necessary. The integration of ethnoscience into Student Worksheet makes learning more relevant to local wisdom while supporting the development of 21st-century skills. This study analyzed articles discussing the role of ethnoscience-based Student Worksheet in strengthening 21st-century skills in science learning through five research questions. The study employed the PRISMA method using data from Google Scholar and Scopus, resulting in 32 articles published between 2020 and 2025. The articles were reviewed based on research trends, topic distribution, measurable outcomes, and implementation. The findings showed a marked increase in publications, peaking at 11 publications in 2025, accompanied by international collaboration that expanded citations and research impact. Research and Development was the dominant research design. Critical thinking skills were the most frequently studied outcome in 17 studies, followed by scientific literacy in 8 studies, while motivation, collaboration, and problem-solving skills were still rarely explored. Ethnoscience frequently incorporated local wisdom, such as traditional games, cultural practices, and food processing, which enhanced conceptual understanding, learning engagement, and 21st-century skills. Overall, ethnoscience-based Student Worksheet makes science learning more contextual and meaningful.

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INTRODUCTION

Science learning in the 21st-century has experienced a paradigm shift from teacher-centered learning to student-centered learning (Pettalongi et al., 2026). The change aims to enable students to develop 21st-century skills, namely various abilities needed to face challenges in the world of education and the world of work, which are increasingly influenced by global economic developments (Kemendikbud, 2021). These skills are essential, as explained by Yunita and Mandasari (2025) because the world of work, education, and social life now require individuals who are adaptive, innovative, and able to solve complex problems independently. The results of the PISA survey show that the majority of Indonesian students are still at the level of Lower Order Thinking Skills (LOTS), indicating the low mastery of 21st-century skills such as critical thinking and problem solving (OECD,

2023). Therefore, science learning should facilitate students in developing these competencies through meaningful and contextual learning experiences. One instructional tool that can facilitate such experiences is the student worksheet.

Novanda *et al.* (2024) have provided an alternative solution to improve 21st-century learning skills, namely the use of learner worksheets. Fadhlulloh *et al.* (2021) also added that 21st-century learning skills can be realized through student worksheet. Masruroh *et al.* (2023) demonstrated that student worksheets meeting the criteria of feasibility and effectiveness can improve students' critical and creative skills. A student worksheet is a teaching material that is systematically compiled with steps in it (Juliana *et al.*, 2024), such as introduction to material, exploration, and consolidation of concepts so that misconceptions that occur can be overcome through student worksheet (Sidik *et al.*, 2025). Muthia *et al.* (2025) stated that students' worksheets are not only in print, but also electronic student worksheet according to technological developments. Electronic student worksheet is an internet-based teaching material that is presented digitally and can contain images, videos, text, and questions with automatic assessment (Khastini *et al.*, 2023).

The success of the learning process, in addition to being supported by technological developments and appropriate teaching materials, needs to be related to the local potential around students (Abshor, 2023). Sartika *et al.* (2024) added that learning based on local wisdom will make students more connected to the social, cultural, and life environment of students so that the learning experience becomes more relevant and meaningful. Some science learning studies involving local culture have shown that students' cognitive learning outcomes in rural areas are better than those in urban areas (Iskandar *et al.*, 2022). Integrating ethnoscience into science learning enhances students' awareness and appreciation of local culture while addressing the limitations of traditional science education, which often lacks meaningful connections between scientific concepts and students' cultural experiences (Latip *et al.*, 2024). Because the connection between scientific concepts and local cultural contexts is still limited, learners often experience difficulties in internalizing scientific knowledge (Listiani, 2025). Yuliyanti *et al.* (2024) show that ethnoscience-based student worksheet, which integrates scientific concepts with local culture and community wisdom, effectively enhances students' critical thinking and scientific literacy, thus supporting the development of 21st-century skills. Scientific literacy is crucial for individuals to make personal decisions based on data about science-related phenomena, such as health and the environment (Rasyid *et al.*, 2026). Meanwhile, critical thinking skills are urgently needed in 21st-century education as they enable students to analyze, evaluate, and make informed decisions when facing complex problems (Noeralfiah *et al.*, 2025). This approach makes learning more relevant and meaningful and encourages students to associate science concepts with cultural identities, thereby increasing motivation and understanding (Rahayu & Ismawati, 2022). Recent reviews from Hikmah *et al.* (2025) also indicate that ethnoscience-based learning can strengthen various dimensions of scientific, environmental, and cultural literacy by connecting school science with students' everyday practices. This evidence shows that ethnoscience is not only relevant for preserving local wisdom but also strategic for preparing students to face the complex challenges of the 21st-century. Theoretically, ethnoscience integrates indigenous knowledge with modern science. This integration fosters meaningful learning as students connect their cultural experiences with formal scientific concepts

(Matindike & Ramdhany, 2025). Consequently, ethnoscience-based student worksheets (LKPD) provide opportunities for students to construct scientific understanding while maintaining appreciation for local cultural knowledge. This perspective provides a theoretical foundation for the integration of ethnoscience into student worksheets, where local knowledge serves as a bridge for understanding scientific concepts.

Although previous systematic reviews have provided valuable insights into ethnoscience-based learning, several important gaps remain. Ahzan et al. (2025) examined ethnoscience integration across various learning media without specifically focusing on Student Worksheets (LKPD). Likewise, Sihombing et al. (2025) and Muyassaroh et al. (2025) primarily discussed publication trends and the general effectiveness of ethnoscience-based learning but did not comprehensively analyze the characteristics of ethnoscience-based LKPD, including forms of ethnoscience integration, targeted learning skills, and future research directions. Therefore, a focused systematic review on ethnoscience-based LKPD is needed to provide a more detailed synthesis of current evidence and identify opportunities for future development. Based on the identified research gaps, this systematic literature review aims to provide a comprehensive synthesis of studies on ethnoscience-based student worksheets (LKPD) in science learning. The review focuses on identifying research trends, mapping the distribution of research topics, examining the forms of ethnoscience integration, analyzing the learning skills addressed, and highlighting future research opportunities.

This review is guided by five research questions (RQs). First, it examines the current research trends in the development of ethnoscience-based student worksheets in science learning. Second, it explores how research topics related to ethnoscience-based student worksheets have evolved over the past five years. Third, it investigates the ways in which ethnoscience has been integrated into student worksheets. Fourth, it identifies the learning skills that have been emphasized in studies on ethnoscience-based student worksheets. Finally, the review seeks to identify future research opportunities for the development of ethnoscience-based student worksheets based on the existing body of literature.

METHOD

This study employed the Systematic Literature Review (SLR) method to collect and analyze studies related to the development of ethnoscience-based student worksheet. The review process followed the PRISMA framework, which emphasizes transparent procedures for identification, screening, eligibility, and inclusion to minimize bias (Hutauruk et al., 2026).

2.1 Research design

Relevant publications on the use of ethnoscience-based student worksheet in learning were obtained from two academic databases, namely Google Scholar and Scopus. The search process was conducted using the Publish or Perish software with Boolean search strings adapted to the systematic review procedure.

Table 1. Search strings used for the systematic review process

Basis Data	Search String
Scopus	TITLE-ABS-KEY ("student worksheet" OR "student worksheet" OR "LKPD" OR "electronic worksheet" OR "electronic worksheet") AND ("Ethnoscience" OR "Ethnoscience")
Google Scholar	TITLE-ABS-KEY"student worksheet" OR "students worksheet" OR "LKPD" OR "e-worksheet" OR "electronic worksheet" AND "Etnosains" OR "Ethnoscience"

2.2 Research procedures

The PRISMA method consists of four stages: identification, screening, quality assessment, and data extraction (Abelha et al., 2020). The review process began by determining the research theme and formulating the research questions. Next, databases and search keywords were developed using Boolean operators (Table 1). The inclusion criteria focused on research articles published between 2020 and 2025. Article selection was guided by the PEO framework (Population, Exposure, and Outcome), as presented in Table 2.

Table 2. Inclusion and exclusion criteria with the PEO framework

Components	Inclusions	Exclusions
Population	Individuals or groups using ethnoscience-based student worksheet, such as students, community members, or research participants.	Review papers and theoretical papers
Exposure	A study that uses Student Worksheet with Ethnoscience content to improve 21 st -century skills in students	Studies that do not utilize Student Worksheet and have no ethnoscience element
Results	Every reported learning outcome, effective outcome or perception of students and teachers	Studies without results or findings, including speculative papers and studies without user evaluation.

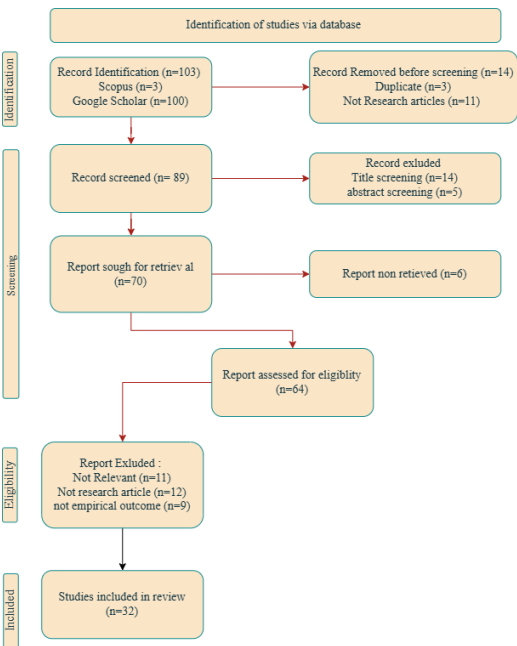


Figure 1. PRISMA flowchart

The initial search identified 103 articles from two databases: 3 articles from Scopus and 100 articles from Google Scholar. After removing duplicates and articles that did not meet the inclusion criteria, 89 articles remained for title and abstract screening. This process excluded 19 articles, leaving 70 articles. Subsequently, 6 inaccessible articles were removed, resulting in 64 articles for full review. Finally, 32 articles were excluded due to irrelevance or lack of empirical findings, leaving 32 articles for further analysis.

2.3 Data Extraction

The data extraction process was structured according to the articles obtained. The reviewers independently conducted the selection process and extracted data from 32 selected articles (Table 3). To ensure objectivity throughout the review, this study adhered to the PRISMA guidelines, consistently applying predefined inclusion and exclusion criteria during screening. Eligible papers were selected through a transparent framework, with data systematically gathered using a standardized extraction form. Furthermore, to minimize subjective interpretation, the findings were synthesized descriptively based strictly on the evidence reported in the included studies.

Table 3. Data extraction details

Data	Learn More
Identity	Author's name, year of publication, study design, data collection method
Design	Design Research conducted
Exposure	A study that uses student worksheet with Ethnoscience content to improve 21 st -century skills in students
Study	Featured ethnoscience studies
Results	Measured results
Key Findings	Summary of key findings

2.4 Bibliometric Analysis

To complement the systematic literature review, a bibliometric analysis was conducted on the 32 selected articles. Metadata from the included studies were exported and analyzed using Biblioshiny (R package) and VOSviewer software. The analysis aimed to visualize keyword co-occurrence patterns and identify emerging research trends related to ethnoscience-based student worksheet. The outputs included network visualization and density maps of author keywords (Figure 3).

RESULTS AND DISCUSSION

This systematic review analyzed 32 articles on the use of Ethnoscience-loaded student worksheet from the Scopus and Google Scholar databases in 2020–2025. In relation to RQ1, the Biblioshiny analysis showed that the number of publications fluctuated from year to year, peaking at 11 articles in 2025. The growing number of ethnoscience-based student worksheet studies reflects increasing awareness of local wisdom’s potential to improve scientific literacy and higher-order thinking skills, although research specifically on student worksheet and electronic student worksheet remains limited (Idrus, 2025). Sihombing et al. (2025) stated that the ethnoscience approach can improve learning outcomes and awareness of local wisdom through contextual cultural integration.

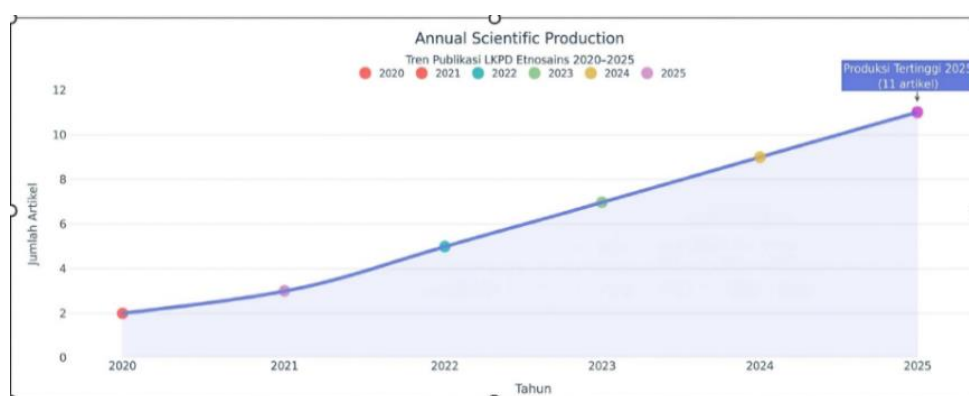


Figure 2. Research trends on the use of student worksheet with Ethnoscience content

Table 4. Five articles with the highest number of citations

Author Name	Co Author	Year	Universitas	Country	Number of Citations
Hariyono	Rizki, I.A.; Lestari, D.A.; Citra, N.F.; Islamiyah, A.N.; Agusty, A.I.	(2023)	Universitas Negeri Surabaya; National Taiwan University of Science and Technology	Indonesia-Taiwan	7
Suprpto et al.,	Noly Shofiyah; Tsung-Hui Cheng	(2024)	Universitas Negeri Surabaya-National Taiwan Normal University	Indonesia – Taiwan	5
Kiswanto	Wardani; Sri; Sudarmin; Sri Nurhayati	(2024)	Semarang State University	Indonesia	2
Sihombing	Shiang-Yao Liu	(2025)	University of Education Indonesia; National Taiwan Normal University	Indonesia-Taiwan	1
Kotimah	Sudarmin; Woro Sumarni	(2024)	Semarang State University	Indonesia	1

The number of citations in Table 4 refers to RQ 2. Within the reviewed studies, [Hariyono et al. \(2023\)](#) received 7 citations, followed by [Suprpto et al. \(2024\)](#) with 5 citations and [Kiswanto et al. \(2024\)](#) with 2 citations. Meanwhile, [Sihombing et al. \(2025\)](#) and [Kotimah et al. \(2024\)](#) each received one citation. This pattern illustrates that the number of citations does not always align with the year of publication. As [Dougherty and Horne \(2022\)](#) explain, the 2023 publication dominates compared with more up-to-date ones, indicating that older articles have more potential to accumulate citations due to the availability of a longer time as a reference. The results of the analysis show that the country's distribution is dominated by Indonesia, with a small part of the research being an international collaboration between Indonesia and Taiwan. Some of the articles came from Semarang State University as national research, while some other articles involved co-authors from universities in Taiwan. Bibliometric findings show that highly cited early publications reflect the maturity and longer exposure of the topic rather than declining interest. Similar findings were reported by [Hasan et al. \(2024\)](#) in interactive learning media studies. In addition, the findings of [Martin et al. \(2016\)](#) on academic buoyancy also support the observation that older publications tend to receive higher citations due to their longer publication period. Furthermore, the country collaboration analysis indicates that this topic remains highly relevant and has strong potential for broader scientific impact. [Farias et al. \(2025\)](#) also explained that international collaboration is often associated with higher citation rates and wider research impact.

Table 5. Table of analysis of findings in articles

Author, Year	Journal	Research Design	Ethnoscience Studies	Forms of Ethnoscience integration	Findings	21 st -century Skills
Wiratama <i>et al.</i> , (2025)	PGMI Partner of MI Education Journal	R&D	Banjari & Gamelan	Local contextual	Validity of material (95%), media (91%), learning (83%), attractiveness (85%), N-Gain 0.79; t-test p=0.001	Science literacy, critical thinking
Jelita, Andromeda (2025)	Journal of Mathematics and Science Education Innovation	R&D (4D)	Baking soda, alum batik liek	Local culture-based project experiments/assessments (PjBL)	Validity V 0.85; teacher practicality 93; students 86	Critical thinking, collaboration, problem-solving
Wariani (2025)	Locus Journal	R&D (4D)	Dyeing NTT woven fabric	Local contextualization	It does not mention in detail the percentage of scores, only indicators of validity, response, and student motivation are mentioned	Critical Thinking
Abshor (2025)	(IJED)	R&D (ADDIE)	Tourism Village	Local contextual	Validity (89%), practicality (90%)	Critical Thinking
Fadilah (2025)	JIIP - Scientific Journal of Education	Quasi-Experiment	Local Cuisine	Problem-based learning with triggering questions	The t-test has a value of 0.001 which is below the significance level of 0.05	Critical Thinking
Rahmawati and Muchlis (2025)	PENDIPA	Quasi-Experiment	Not mentioned in detail	Inquiry learning	N-gain 0.7206 (high)	Critical Thinking
Nugraheni (2025)	Journal of Science Education	R&D (4D)	Traditional transportation	Local contextual	Validity 91.19% Positive response 87.28%	Critical Thinking
Hidayah (2025)	JPPIPA	R&D (ADDIE)	Ethnoscience in elemental matter, compounds, and mixtures	Local contextual	High validity (0.91) and Reliability 93%	Critical Thinking and Science Literacy
Suyanto <i>et al.</i> , (2024)	Al-Birun Scientific Journal of Physics Education	R&D (ADDE)	Gamelan (sound waves)	Local contextualization	Validity (3.6), teacher readability and response tests (92.5%) in the very practical category	Critical Thinking
Sari <i>et al.</i> , (2024)	JIPP	R&D	Ethnoscience of sound (NTB culture)	Local contextualization	Validity (92.8%), answer (88%)	Science literacy

Author, Year	Journal	Research Design	Ethnoscience Studies	Forms of Ethnoscience integration	Findings	21 st -century Skills
Indah et al (2024)	Chemistry Education Practice	R&D (4D)	Sate Bulayak from NTB	Experiment with local culture-based tasks (PjBL)	Valid, practical, effective (N-gain 0.62)	Critical Thinking
Lia et al., (2024)	Chemistry Education Practice	R&D (ADDIE)	Ethnosains colloid system	Experiment with local culture-based tasks (PjBL)	Validity (0.82–0.83), practicality (87%)	Critical Thinking
Novanda (2024)	Journal of Mathematics and Natural Sciences Education	R&D (ADDIE)	Suwara Suwir Typical Snack of the City of Jember	Experiment with local culture-based tasks (PjBL)	Valid (86–90%), Practical (88.53%), N-gain 0.6 (moderate)	Scientific Arguments
Kiswanto et al., (2024)	JKPPK	R&D (4D)	Traditional snacks of Limbangan Market	Experiment with local culture-based tasks (PjBL)	Efficacy 96%, N-gain is 0.79, positive student response 51%	Critical Thinking
Novanda et al., (2024)	JPPIPA	R&D (ADDIE)	Typical Lampung food and drink	Experiment with local culture-based tasks (PjBL)	N-gain CT: 0.86, N-gain literacy: 0.87, High effective	Critical Thinking and Science Literacy
Suprpto et al., (2024)	Journal of Education and Learning	PLS-SEM	Madura cattle frequency	Local contextualization	Path coefficient 0.511	Learning motivation
Siami et al., (2023)	Journal of Science Education Research	R&D (4D)	A Taste of Semarang	Experiment with local culture-based tasks (PjBL)	Eligibility (94.7%) with the category of very feasible, the value of N-gain (0.81) with the category of very high,	Chemical Literacy
Fikrina et al., (2023)	Journal of Chemistry and Education	R&D (ADDIE)	Pekalongan Batik (Acid-Base)	Experiment with local culture-based tasks (PjBL)	Feasibility (49.25) in the very feasible category, practicality (92.15) in the very practical category, effectiveness with N-gain (0.66) in the medium category	Numeracy Literacy and Collaboration
Muhlis (2023)	USEJ	R&D (3D)	mangeppi gun	Local contextual	85% validity (very valid) and suitable for use to improve science literacy	Science Literacy
Zahra and Destya (2024)	ISETH	R&D (ADDIE)	Etnosains (one)	Local contextual	Material validity 90%, Media 87.5% and suitable for use	Cognitive skills

Author, Year	Journal	Research Design	Ethnoscience Studies	Forms of Ethnoscience integration	Findings	21 st -century Skills
Suparwati et al., (2023)	JPK Undiksha	R&D (4D)	Balinese Cultural Ethnoscience	Local contextual	N-gain 0.76 (high)	Critical thinking
Hariyono et al., (2023)	Journal of Science Education Research	Quasi Experiment	Traditional game Engklek	Problem-based learning with triggering questions	The MANOVA test showed a significant difference (Pillai's Trace = 0.392; Wilks' Lambda = 0.608; sig = 0.003)	Critical Thinking
Mahyuni et al., (2022)	Journal of Science Education Research	R&D	The context of local wisdom in the classification material living things	Local contextual	Validity (95%) with very valid categories	Science Literacy
Prima et al., (2022)	Universe Journal	R&D (4D)	Not mentioned	Local contextual	Validity (3.13 = valid)	Critical Thinking
Junita & Yuliani, (2022)	BioEdu	R&D (4D)	Salted Eggs	Experiment with local culture-based tasks (PjBL)	Validity 98%, Practicality 97%, and Completeness 100%	Science Literacy
Handayani et al., (2022)	JCAR	R&D (4D)	Traditional traditions of Sade Village	Local contextual	Valid (87.29%) and Practical (90%)	Culturally Responsive
Wijayanti et al., (2022)	Response: Journal of Basic Education Research and Innovation	Quasi experiments	Ethnoscience (local cultural context)	Problem-based learning with triggering questions	Pretest: 100% of students in the range 0–60, Posttest: 34.4% (91–100) & 65.8% (81–90), and T-Test: sig 0.000	Critical Thinking
Andani et al., (2020)	Journal of Science Education Research	R&D (ADDIE)	Surabi Cake	Experiment with local culture-based tasks (PjBL)	Validity (85.20) with the category of very feasible to use, the level of creativity increased (89%) is suitable for use as teaching materials	Creativity
Lia et al., (2024)	JIPP	R&D (ADDIE)	Not explained	Inquiry is directed at problem solving	High validity (0.83; 0.82) and practicality 89.1%	Motivation and Problem Solving
Hayati et al., (2020)	Journal of Physics	R&D	Traditional medicinal plants of Bukit Ajimut	scientific inquiry learning	High content validity (Aiken's V), very strong reliability ($\alpha = 0.99$), 15 valid items	Information mining, communication, <i>scientific inquiry</i>

Table 5 shows that most studies adopted Research and Development (R&D), particularly the ADDIE and 4D models. Ethnoscience was commonly integrated through local wisdom, including traditional games, food processing, cultural practices, and natural resources. The worksheets were frequently implemented using Project Based Learning (PjBL), Problem Based Learning (PBL), and contextual learning approaches. These findings indicate that Research and Development (R&D) remains the dominant approach because ethnoscience-based student worksheets are still relatively limited, encouraging researchers to systematically develop learning materials from the analysis stage through evaluation (Sari et al., 2023). The ethnoscience content is mostly derived from local wisdom, such as traditional games, cultural practices, traditional food production, and the use of local natural resources. This approach has strong pedagogical value because it integrates cultural knowledge with scientific concepts (Muyassaroh et al., 2025). Supiyati et al. (2024) explained that traditional games can be an effective learning context because they contain authentic science concepts, increase student engagement, and connect learning to their life experiences. Tohe et al. (2024) also added that local food manufacturing practices can be reconstructed into chemical and biological concepts that are relevant to science learning. Local natural resources support contextual and sustainable learning, while strengthening awareness of protecting the environment and local culture (Fadilah et al., 2025). However, most studies still limit ethnoscience integration to the introduction of local wisdom without deeply exploring the embedded scientific concepts (Latip et al., 2024). Several studies, such as those by Hidayah (2024), suggest that ethnoscience learning can be optimized through models such as Problem Based Learning and Project Based Learning, which encourage students to solve problems and create projects. This is supported by Rohman et al. (2026), who argued that ethnoscience learning should connect local wisdom with scientific concepts to improve conceptual understanding, scientific literacy, creativity, and collaboration skills.

Table 6. Frequency of measured results

Measured results	Frequency
Critical Thinking	17
Science Literacy	8
Motivation	3
Collaboration	2
Problem Solving	2
Chemical Literacy	1
Scientific Arguments	1
Literacy and Numeracy	1
Cognitive Skill	1
Culturally Responsive	1
Creativity	1
Scientific Research	1

Table 6 summarizes the learning outcomes investigated in the reviewed studies. Critical thinking was the most frequently assessed competency (17 studies), followed by scientific literacy (8 studies), motivation (3 studies), and collaboration and problem-solving (2 studies each). Other

competencies, including chemical literacy, scientific argumentation, numeracy literacy, cognitive skills, cultural responsiveness, creativity, and scientific investigation, were reported in only one study each. These findings indicate that ethnoscience-based student worksheet research has primarily focused on developing 21st-century skills, particularly critical thinking and scientific literacy, whereas competencies such as motivation, collaboration, problem-solving, creativity, and scientific argumentation have received considerably less attention. This trend reflects the urgent need to strengthen students' critical thinking skills, especially in the Indonesian educational context. [Hesiy et al. \(2023\)](#) reported that many students still experience difficulties in mastering scientific concepts because of insufficient critical thinking abilities. Therefore, the dominance of higher-order cognitive skills identified in RQ4 suggests opportunities for future studies to expand the development of ethnoscience-based student worksheets toward other important learning competencies. [Fauziah et al. \(2024\)](#) emphasized that critical thinking and scientific literacy are essential 21st-century competencies. Similarly, [Nadeak et al. \(2020\)](#) argued that these competencies support evidence analysis, argument evaluation, decision-making, and data-driven problem solving. Meanwhile, [Diani et al. \(2023\)](#) explained that motivation and collaboration also play important roles as supporting factors that strengthen the learning process. [Kusuma & Sumarni \(2024\)](#) further suggested that ethnoscience-based student worksheet should be designed to develop all these indicators through contextual problems that engage students in analyzing, evaluating, and applying scientific concepts from local wisdom. This comprehensive assessment approach aligns with the goals of ethnoscience-based student worksheet, which aims to develop higher-order thinking skills through meaningful learning contexts ([Fatmi et al., 2026](#)). Overall, the findings indicate that the integration of ethnoscience into student worksheets functions not only as a contextual learning approach but also as an effective medium for developing 21st-century competencies, including critical thinking, scientific literacy, collaboration, and scientific argumentation through activities grounded in local culture. By engaging students with contextual problems derived from their surrounding environments, ethnoscience-based student worksheets help connect scientific concepts to everyday life, thereby making science learning more meaningful and relevant ([Herayanti et al., 2025](#)).

Bibliometric analysis using VOSviewer showed the relationship between keywords on the network map and density (Figure 3). The color gradation on the map reflects the development of the topic from 2020 (purple) to 2025 (yellow). The keywords "ethnoscience" and "student worksheet" had the highest density, signaling the focus of the research. Meanwhile, "problem-based learning", "creative thinking", and "science literacy" were at moderate density as supporting variables. The "e-LKPD" and "redox" showed low density, which indicates potential gaps in future research. The findings related to RQ5 indicate that ethnoscience-based student worksheets are most effective in enhancing critical thinking and scientific literacy. Therefore, their development should emphasize analytical and evidence-based activities. This is supported by the network map analysis, which shows that "ethnoscience" and "LKPD" are the most dominant keywords, highlighting their central role in current research. [Alega et al., \(2025\)](#) stated that ethnoscience-based student worksheet effectively promotes critical thinking through contextual and exploratory learning based on students' cultural experiences. In addition, the emergence of electronic student worksheet reflects a shift from printed to digital learning media that is more adaptive to modern education. [Kotimah et al., \(2024\)](#) also

found that ethnoscience-based electronic student worksheet has high validity and is effective in improving critical thinking and scientific literacy, making it highly feasible for science learning development. Overall, the VOSviewer analysis highlights that ethnoscience and student worksheets remain the dominant focus of current research, while topics related to broader 21st-century competencies, diverse science contexts, and digital learning innovations are still relatively limited. This finding suggests opportunities for future studies to expand ethnoscience-based student worksheet development across a wider range of science topics and technology-enhanced learning environments.

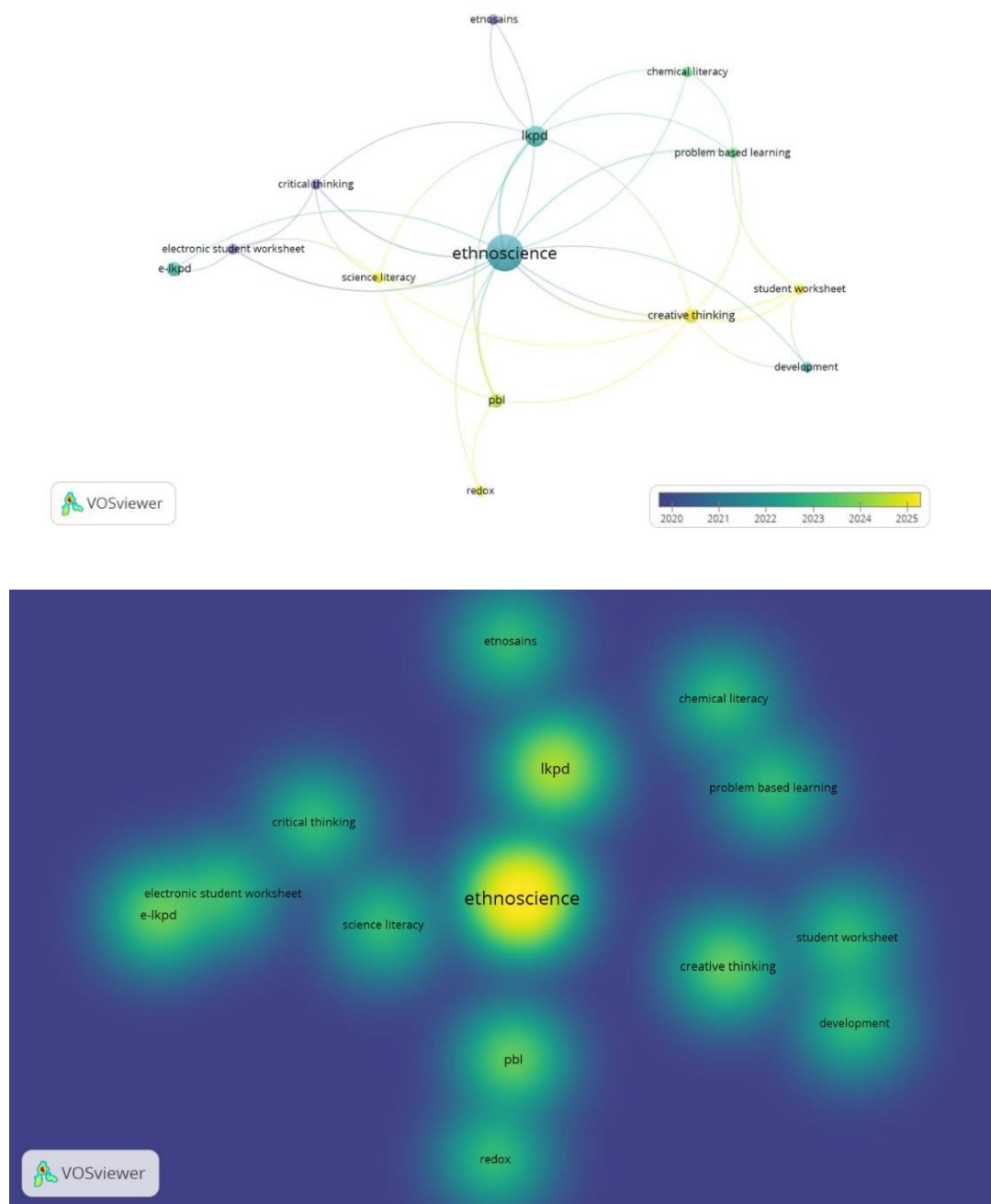


Figure 3. Network map (left) and density (right)
Source: Original documentation

The findings of this review have important implications for educational practice and future research. Ethnoscience-based student worksheets can support teachers in implementing contextual science learning by connecting scientific concepts with students' cultural experiences, thereby fostering critical thinking and scientific literacy. In addition, the findings provide a reference for curriculum developers to strengthen the integration of local wisdom into science education. Future research should also expand the development of ethnoscience-based student worksheets by exploring underrepresented competencies, such as collaboration, scientific argumentation, creativity, and digital learning environments.

This review has several limitations. Most of the included studies were conducted by Indonesian researchers and published within the Indonesian educational context, reflecting the widespread development of ethnoscience-based student worksheets in Indonesia. Consequently, the findings may not be fully generalizable to other countries with different educational and cultural contexts. Furthermore, the reliance on Google Scholar and Scopus as the primary databases may have limited the inclusion of relevant studies indexed in other international databases. In addition, this review did not include a formal methodological quality assessment of the selected studies. Future reviews are encouraged to include broader international databases, apply standardized quality assessment procedures, and use more diverse search terms to provide a more comprehensive global perspective on ethnoscience-based learning materials.

CONCLUSION

This systematic review concludes that ethnoscience-based student worksheets have become an increasingly important research topic in science education, with Research and Development as the dominant research design. The findings indicate that ethnoscience integration effectively supports the development of critical thinking and scientific literacy by connecting scientific concepts with authentic cultural contexts. In addition, the review highlights opportunities for future research to expand ethnoscience-based student worksheets toward broader 21st-century competencies, digital learning environments, and more diverse science topics, thereby supporting more meaningful and contextual science education.

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