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INTEGRATING ETHNOSCIENCE INTO SCIENCE LEARNING ASSESSMENT : TOWARD CULTURALLY RESPONSIVE EVALUATION

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ABSTRAK

This study aims to examine the extent of the integration of local wisdom (ethnoscience) in the science learning evaluation instrument. The study conducted in the form of the type of instrument developed, measurement of instrument quality and also the instrument development model used. This study is a Systematic Literature Review (SLR) study using the PRISMA method with the stages of formulating research questions, collecting literature, determining inclusion and exclusion criteria, collecting data from literature that is still in the inclusion criteria, data analysis and data presentation. The literature was excavated from the Google Scholar and eric.ed.gov websites in the period 2015 – 2025. The number of literature that met the inclusion criteria was 12 articles. The results of the study stated that: 1) the integration of local wisdom (ethnoscience) in the science learning evaluation instrument is limited to the form of tests; 2) the measurement of instrument quality carried out in the form of validity, reliability, discrimination and difficulty level tests and 3) the test development model used partly uses the ADDIE development model

Keywords: Integration; ethnoscience; instrument; evaluation; science learning; SLR

INTRODUCTION

Natural Sciences (IPA) is one of the most essential fields of knowledge for every individual to master. This is because IPA is contextual in nature—people interact with scientific phenomena in their daily lives. Moreover, the ability of human resources to master science and apply it through technology can serve as a symbol of a nation's prestige in the international arena(Wijaya *et al*., 2024). Therefore, the Indonesian government has integrated science as a subject from elementary to higher education levels. In the current curriculum, science at the elementary school (SD) level is combined with social studies (IPS) into a subject called Natural and Social Sciences (IPAS). At the junior high school (SMP) level, science is taught as a standalone subject, while in senior high school (SMA), it is divided into three branches: biology, physics, and chemistry (Wijaya *et al*., 2024)

Indonesia is a country rich in local wisdom that contains scientific values. The science contained in local wisdom is referred to as ethnoscience. Ethnoscience is formed from the interaction between communities and the natural environment and is passed down orally through generations. This concept often originates from a trial-and-error process carried out by communities as they engage with their environment. Various regions in Indonesia have unique ethnoscience potentials that

are worthy of preservation (Rahmatih *et al*., 2020; Sarini & Selamet, 2019). For example, in Bali, the *Ogoh-Ogoh* parade involves the concept of force and effort (physics) when the statues are carried. Additionally, local treatments for skin irritation caused by bee or insect stings involve pamoryang, which aligns with the chemistry topic of acids and bases. Among the Sasak people, the traditional *Gendang Beleq* drum reflects the physics concept of sound, while the local delicacy *Poteng Jaje Tujak* involves traditional biotechnology during its preparation(Puspita *et al*., 2022).

Ethnoscience should be integrated into science learning. In addition to preserving local wisdom for students, the integration of ethnoscience into science education also brings several positive impacts. Firstly, it can improve students' academic performance—cognitively, affectively, and psychomotor-wise (Putri *et al*., 2022). Secondly, it can enhance critical thinking skills, interest in learning, motivation, and students' scientific process skills(Mukti *et al*, 2022). This happens because learning science through ethnoscience enables students to learn in a meaningful and contextual way, allowing them to see science as something close to their daily lives, thereby enhancing concept retention.

The integration of ethnoscience in science learning should not only be limited to the planning and instructional stages but should also extend to the assessment aspect. Most research on the integration of ethnoscience in science learning has focused on the planning stage, such as developing learning resources and instructional media. However, research on the development of science assessment instruments that incorporate ethnoscience is still limited. Therefore, the researcher is interested in conducting a Systematic Literature Review (SLR) focusing on the integration of ethnoscience in science education, particularly in the context of assessment. This research is expected to serve as a reference for future studies in science education, helping identify gaps related to ethnoscience integration in assessment practices.

Several SLR studies on the integration of ethnoscience in science learning have already been conducted. For instance,Widiarini *et al* (2025) carried out an SLR study on the integration of Balinese local wisdom in science learning. While this study shares similarities with the present research—both being SLRs and focusing on local wisdom—the difference lies in scope: the present study focuses specifically on the integration of local wisdom (ethnoscience) into science assessment instruments and their quality, whereas the former focuses more broadly on Balinese local wisdom in science instruction.

Another study by Nurjanah *et al* (2024) examined the implementation of local wisdom in science learning. This study is also similar in terms of methodology and topic. However, the distinction lies in focus—Nurjanah et al. emphasized the integration of local wisdom into science learning tools such as media or instructional resources and evaluated their effectiveness, whereas this study emphasizes the integration of local wisdom into assessment instruments and the quality of those instruments.

METHOD

This research is classified as a Systematic Literature Review (SLR),

which aims to identify, analyze, interpret, and evaluate existing research based on predetermined research questions (Siswanto & Meiliasari, 2024). The study follows the PRISMA method, which consists of several stages. The research stages are presented in the following diagram.

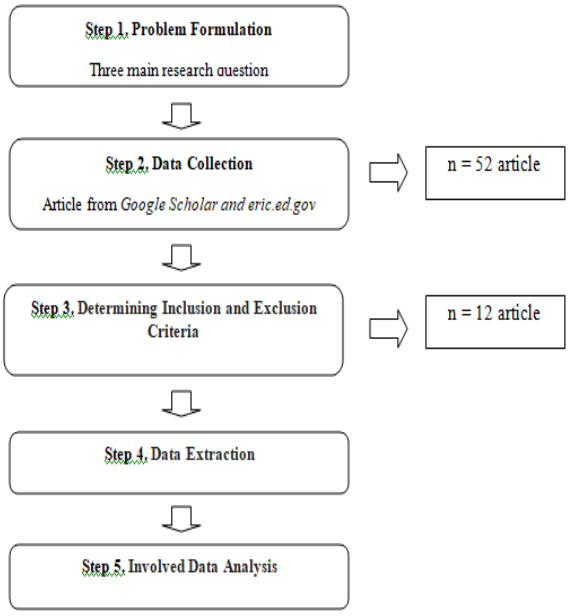

Diagram 1. Steps of the Research

The first stage is problem formulation, where the researcher defines three main research questions for this study:

1. What types of science learning evaluation instruments that integrate local ethnoscience wisdom have been developed so far?
2. What are the development stages of science learning instruments that integrate local ethnoscience wisdom?
3. What is the quality of science evaluation instruments that integrate local ethnoscience wisdom?

The second stage is data collection. The researcher collected research data in the form of journal articles and conference proceedings obtained from Google Scholar and eric.ed.gov. The researcher limited the publication year of the articles to the last 10 years, from 2015 to 2025. To facilitate the search process, the following keywords were used: development, science instruments, local wisdom, and ethnoscience. From this search, 52 relevant articles were found.

The third stage involves determining inclusion and exclusion criteria. These criteria are essential for selecting articles relevant to the keywords and aligned with the research questions. The inclusion criteria used in this study were: 1) Articles must focus on the development of science evaluation instruments integrated with local ethnoscience wisdom ; 2) Articles must come from journals or proceedings with ISSN ; 3) Articles must be the result of developmental research and 4) Articles must have been published within the 2015–2025 range. The exclusion criteria included: 1) Articles that only provide an abstract without full-text access ; 2) Articles from journals or proceedings without ISSN and 3) Articles that do not present the development process of science evaluation instruments. After applying these criteria, 12 articles were found to meet the inclusion standards.

The fourth stage is data extraction. The selected articles were reviewed to extract data on the types of science evaluation instruments developed, the development models used, and how instrument quality was measured. The extracted data were then presented in a table to facilitate the analysis and interpretation process. Once the data were compiled and organized, the final stage involved data analysis, which aimed to answer the research questions posed in this

study(Arthana *et al*., 2024; Khairunnisa *et al*., 2022)

RESULTS AND DISCUSSION

The data collected from 12 (twelve) journal articles and conference proceedings that met the inclusion criteria are presented in Table 1 below

Table 1. Data Analysis Results of Articles That Met the Inclusion Criteria

No	Author	Title	Type of Instrument	Measurement Quality	Development Models
1	Ningsetyo & Sunarti (2024)	Pengembangan Instrumen Tes Literasi Sains Berbasis Kearifan Lokal di Probolinggo	Test	Validity, Reliability, differentiability of the items and difficulty level	Sugiyono development model
2	Lestari et al., 2024)	Pengembangan Instrumen Tes IPA Berbasis Kearifan Lokal Blitar pada Siswa Sekolah Dasar	Test	Validity, Reliability, differentiability of the items and difficulty level	Borg & Gall development model
3	Murti & Sunarti (2021)	Pengembangan Instrumen Tes Literasi Sains Berbasis Kearifan Lokal di Trenggalek	Test	Validity, Reliability, differentiability of the items and difficulty level	Sugiyono development model
4	Fatimah et al., (2024)	Pengembangan Instrumen Tes Penalaran Ilmiah Berbasis Inkuiri Terintegrasi Etnosains untuk Calon Guru Sekolah Dasar : Studi Analisis Kebutuhan	Test	Not measured	ADDIE development model
5	Almuharohmah et al,. (2018)	Pengembangan Instrumen Tes Keterampilan Berpikir Kreatif Siswa SMP Terintegrasi Kearifan Lokal	Test	Validity, Reliability, differentiability of the items and difficulty level	ADDIE development model
6	Amalia et al., (2024)	*Development of Scientific Literacy Instrument Based on Riau Malay Ethnoscience in Science Subject*	Test	Validity and practicality	Plomp development model
7	Mar'ah et al, (2021)	*Development of Science Literature Instruments*	Test	Validity, Reliability,	ADDIE development

		Contain Ethnoscience in Science Subject for Class IV Elementary School Student		differentiability of the items and difficulty level	model
8	Darmawati et al., (2025)	Validasi Instrumen Literasi Sains pada Konteks Batik Madura Materi Unsur, Senyawa dan Campuran.	Test	Validity and student's response	ADDIE development model
9	Suttrisno (2024)	Pengembangan Instrumen Evaluasi *Higher Order Thinking Skills* (HOTS) berbasis Etnosains pada Pembelajaran IPAS Kurikulum Merdeka	Test	Validity and difficulty level	ADDIE development model
10	(Agustin et al., 2018)	Desain Instrumen Tes Bermuatan Etnosains untuk mengukur Keterampilan Berpikir Kritis Siswa SMA	Test	Validity, Reliability and differentiability of the items	ADDIE development model
11	Winarto et al (2022)	*Developing a Problem Solving Essay Test Instrument (PSETI) in the Instruction of Basic Science Concepts in Ethnoscience Context*	Test	Validity and Reliability	Oriondo & Dallo-Antonio development model
12	Maulida & Sunarti (2022)	Pengembangan Instrumen Tes Literasi Sains Berbasis Kearifan Lokal di Kabupaten Lamongan	Test	Validity, Reliability and differentiability of the items	Sugiyono development model

Based on the data presented in Table 1, it can be concluded that the integration of local wisdom or ethnoscience into science learning evaluation instruments was 100% developed in the form of tests. Regarding the measurement of instrument quality, 100% of the instruments had undergone validity testing, 75% had been tested for reliability, 58.33% had been tested for discrimination index, and 50% had been tested for difficulty level. In terms of development models, the most commonly used was the ADDIE model (Analyze, Design, Develop, Implement, and Evaluate), which was applied in 50% of the analyzed articles.

The research findings indicate that the integration of local wisdom or ethnoscience into science evaluation instruments has so far been developed in the form of tests. These tests aim to measure scientific literacy, scientific reasoning, creative thinking skills, critical thinking, and higher-order thinking skills.

Ethnoscience-based scientific literacy tests align well with the PISA science literacy dimensions, particularly in terms of content knowledge and science in context. Through such tests, students are assessed on their ability to understand science within the framework of local culture and to analyze the scientific concepts embedded within it—thereby enhancing their higher-order thinking skills (Wijaya *et al*., 2023). Likewise, ethnoscience-based critical thinking tests help assess students' ability to connect scientific concepts with local culture and perform analysis based on repeated observations—thus fostering their critical thinking abilities (Afrianawati et al., 2016; Dewi *et al*., 2023). Kemudian tes keterampilan In addition, creative thinking tests with ethnoscience content encourage students to develop original and detailed ideas..

Science learning evaluation instruments integrated with ethnoscience have also undergone validity testing, which is crucial to determine whether the instrument appropriately measures the intended variables (e.g., science literacy, thinking skills, and other cognitive outcomes). Reliability testing is equally important to ensure that the instrument yields consistent results when used repeatedly to measure cognitive aspects (Saputri *et al*., 2023). Furthermore, discrimination index and difficulty level testing are vital to evaluate whether the test can differentiate among students' abilities and whether the test items are appropriate for the target cognitive level (Fauzan *et al*., 2021).

The ADDIE development model was frequently used. This model is favored because it ensures high product quality, as each stage involves evaluation before proceeding to the next step (Waruwu, 2024). However, ADDIE is not the only model available—other models can be used depending on the developer's available time, resources, and budget.

The analysis revealed that the integration of ethnoscience into science learning evaluation instruments is still limited to test-based instruments. This indicates that the integration has not yet comprehensively addressed the nature of science (IPA), which includes not just product, but also process and attitudes. Therefore, there is an opportunity for future research to develop ethnoscience-integrated science learning instruments that assess attitudes and psychomotor skills.

For example, scientific attitudes—such as curiosity, critical thinking, perseverance, discipline, and responsibility—can be measured through attitude instruments. An ethnoscience-based attitude instrument would help assess how curious students are about their local culture, how critical and persistent they are in exploring it.

Additionally, the development of psychomotor instruments—especially those assessing science process skills—should also incorporate ethnoscience. These may include students' abilities in observing, interpreting, predicting, and communicating scientific concepts based on local cultural phenomena. Suitable formats for psychomotor instruments may include rubrics, performance observation sheets, and other relevant tools.

CONCLUSION

Based on the findings of this systematic literature review (SLR), it can be concluded that the integration of local wisdom (ethnoscience) in science learning

evaluation instruments has so far been limited to test-based instruments. The quality of these instruments has been measured through validity, reliability, discrimination index, and difficulty level, with some also measuring practicality and collecting student response questionnaires. The ADDIE development model is the most widely used in developing science evaluation instruments integrated with ethnoscience. Based on these findings, it is recommended that science education researchers and educators develop evaluation instruments that integrate local wisdom/ethnoscience not only for cognitive aspects but also for attitudes and psychomotor skills. A limitation of this study is that most of the reviewed articles were from nationally accredited journals, and few came from reputable international journals.

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