



Unveiling the needs for ethnoscience-based e-worksheets to enhance nature of science and environmental awareness of elementary school students

Wulan Octi Pratiwi^{1*}, Sunyono², Fatkhur Rohman³, Rangga Firdaus⁴
^{1,2,3,4}Faculty of Teacher Training and Education, Universitas Lampung, Indonesia

*Corresponding author: wulanoctipratiwi@gmail.com

Article Info

Article history:

Received: January 31, 2024

Accepted: March 27, 2024

Published: March 31, 2024

Keywords:

E-worksheets
Environmental awareness
Ethnoscience
Nature of science

ABSTRACT

This study aims to describe the analysis of the development needs of an ethnosciences-based e-worksheet. The research utilizes the 4D Research and Development model, specifically focusing on the define stage, which employs descriptive data analysis techniques. The research instruments consist of interviews with natural and social sciences teachers and questionnaires assessing the needs of both teachers and students. A preliminary study involved 136 students and 5 natural and social sciences teachers from 5 Elementary Schools in Bandar Lampung. The teachers' needs questionnaire results indicate that 100% of the teachers have not yet integrated natural and social sciences learning by connecting science knowledge with local Lampung culture. Similarly, the student's needs questionnaire shows that 89% have not experienced natural and social sciences learning integrated with Lampung's local culture. Furthermore, based on the results of the students' and teachers' needs questionnaires, 84% of the students answered "yes," indicating they strongly agree, and 100% of the teachers also answered "yes," indicating strong agreement, regarding the potential development of ethnosciences-based e-worksheet. This study implies the importance of instructional materials integrating local wisdom to enrich the learning process, support scientific literacy, and enhance environmental awareness.

Analisis kebutuhan lembar kerja peserta didik elektronik berbasis etnosains untuk meningkatkan *nature of science* dan kesadaran lingkungan peserta didik sekolah dasar

ABSTRAK

Kata Kunci:

Lembar kerja peserta didik elektronik
Kesadaran lingkungan
Etnosains
Nature of science

Penelitian ini bertujuan untuk menjelaskan analisis kebutuhan pengembangan lembar kerja elektronik berbasis etnosains. Penelitian ini menggunakan model Penelitian dan Pengembangan 4D, khususnya fokus pada tahap *define*, yang menggunakan teknik analisis data deskriptif. Instrumen penelitian terdiri dari wawancara dengan pendidik ilmu pengetahuan alam dan sosial serta kuesioner kebutuhan pendidik dan peserta didik. Studi pendahuluan melibatkan 136 peserta didik dan 5 pendidik ilmu pengetahuan alam dan sosial dari 5 Sekolah Dasar di Bandar Lampung. Hasil kuesioner kebutuhan pendidik menunjukkan bahwa 100% pendidik belum mengintegrasikan pembelajaran ilmu pengetahuan alam dan sosial dengan menghubungkan pengetahuan ilmu pengetahuan dengan budaya lokal Lampung. Demikian pula, kuesioner kebutuhan peserta didik menunjukkan bahwa 89% belum mengalami pembelajaran pengetahuan ilmu alam dan sosial yang

terintegrasi dengan budaya lokal Lampung. Selain itu, berdasarkan hasil kuesioner kebutuhan peserta didik dan pendidik, 84% peserta didik menjawab "ya," menunjukkan kategori "sangat setuju", dan 100% pendidik juga menjawab "ya," menunjukkan kategori "sangat setuju", terkait dengan potensi pengembangan lembar kerja elektronik berbasis etnosains. Studi ini mengimplikasikan pentingnya bahan ajar yang mengintegrasikan kearifan lokal untuk memperkaya proses pembelajaran, mendukung literasi ilmiah, dan meningkatkan kesadaran lingkungan.

© 2024 Unit Riset dan Publikasi Ilmiah FTK UIN Raden Intan Lampung

1. INTRODUCTION

The concept of Nature of Science (NoS) has regained prominence within science education communities, being recognized as a crucial element of scientific literacy [1]. Comprehending the NoS constitutes a vital aspect of scientific literacy [2]-[4]. Numerous science education documents, including those from the American Association for the Advancement of Science and the National Research Council, underscore the importance of understanding the NoS in enhancing participants' educational experiences [5]. The significance of understanding the NoS lies in its necessity for creating, managing, and processing scientific and technological advancements. It informs decision-making on socio-scientific matters and fosters an appreciation for science as a crucial aspect of contemporary culture.

Furthermore, NoS aids in developing an understanding of the norms within the scientific community, enabling individuals to uphold moral commitments that hold universal value to society. Moreover, it facilitates learning scientific subjects [6], [7]. The importance of students grasping the NoS necessitates researching how NoS is taught and evaluated [8], [9].

An understanding of the NoS is a pivotal component of scientific literacy. It enhances students' comprehension of scientific concepts and empowers them to make well-informed decisions regarding both personal and social issues rooted in science [10], [11]. Another study suggests that for students to grasp NoS effectively, it should be deliberately included in lesson planning and evaluation. This entails setting instructional goals centered around science and engineering practices, core disciplinary concepts, and overarching themes [9]. NoS is considered a vital conduit for fostering the growth and advancement of students' attitudes, skills, and knowledge [6], [12]. Understanding the NoS empowers students to hone their reasoning, critical thinking, and application of scientific knowledge. Additionally, it fosters positive attitudes among students, making NoS a crucial foundation for navigating and thriving in a society rife with challenges. This significance extends beyond material aspects, especially in today's dynamic landscape shaped by globalization and rapid advancements in Science and Technology [3], [13].

In the present era of globalization and technological advancement, addressing environmental issues and ensuring food security are as critical as improving student literacy [14]. The escalation of these two issues stems from the expanding human population, which amplifies the demand for a clean environment and adequate food resources [15]. Environmental concerns include the difficulty of managing waste, as the growing human population and rising consumption levels lead to an accumulation of waste, posing a substantial threat of pollution to the environment [16]. Environmental challenges extend to climate change, biodiversity loss, financial crises, and even economic downturns, necessitating global readiness and cooperation to address them [17]. As consumers of Earth's natural resources, humans are responsible for conserving these resources for future generations. Consequently, as stewards of the planet for future

generations, present-day society must be prepared to enhance the quality of life and confront the myriad challenges that await humanity on a global scale [18].

The endeavor to enhance the quality of life for all individuals worldwide, both now and in the future, is achieved through implementing sustainable development practices [14]. Schools play a crucial role as the primary cornerstone for instilling the values inherent in Education for Sustainable Development (ESD) [14], [19]. ESD is intended as a collective endeavor to equip individuals with the knowledge, skills, values, and attitudes necessary to shift perspectives and collaborate toward building a sustainable future aimed at preserving the Earth's environment [20]. The occurrence of environmental issues or degradation is attributed to human negligence. Human actions leading to environmental problems stem from a lack of accountability towards the environment and insufficient environmental consciousness [4], [20]. Previous research indicates that environmental awareness behavior is influenced by three key factors: external conditions (environmental factors), individual personality traits, and one's relationship with nature. [21]. A person's environmental awareness level may not always be high, as several factors, including environmental knowledge, values, and behaviors, influence it.

Environmental awareness also entails assisting social groups and individuals in developing awareness and sensitivity to the environmental issues they encounter in their surroundings [3], [22]. Education is crucial in enhancing students' environmental awareness and fostering a sense of responsibility toward preserving the environment [23], [24]. Due to a deficiency in environmental awareness, students exhibit minimal behavior, reflecting a sense of responsibility toward protecting the environment [25], [26]. To address the escalating environmental issues, it is essential to cultivate environmental awareness [27]. The absence of a sense of responsibility among students toward the environment can lead to detrimental outcomes. A lack of environmental awareness results in individuals disregarding and damaging the natural surroundings, jeopardizing the ecosystem's integrity. Urgent preventive measures, primarily through education, are imperative to mitigate these risks [28], [29]. Amidst the educational revolution of Industry 4.0, the education system requires innovative approaches to address emerging challenges. This era has ushered in a paradigm shift, incorporating internet-based technologies tailored to meet students' diverse needs [16]. As evidenced by previous studies, the rapid development of science and technology, while easing human life, also generates numerous challenges. Without proper constraints, this advancement can encroach upon various aspects of humanity, inevitably leading to many problems [18]. Ethnoscience, also known as indigenous science, represents a cultural element that can be seamlessly integrated into science education [30]. Ethnoscience serves as a strategic approach for crafting learning environments and designing educational experiences that seamlessly integrate culture into the learning process within elementary schools [16], [31].

Ethnoscience-based learning bridges indigenous knowledge rooted in society with scientific learning, utilizing elements of local culture or the surrounding environment to facilitate learning [18], [32]. Implementing an ethnoscience approach to learning empowers teachers and educational practitioners to impart science education grounded in culture, local wisdom, and community issues. This approach enables students to comprehend and apply natural science concepts in real-life contexts, equipping them with the skills to address everyday challenges effectively [20], [33].

Ethnoscience learning represents a novel educational breakthrough, seamlessly blending culture with science. By incorporating local culture and wisdom as integral learning components, ethnoscience enhances the significance of education and boosts students' scientific literacy. Furthermore, research introduces students to culture-oriented

learning, fostering a deeper appreciation for their culture and nation. Ethnoscience-based learning showcases the diverse potentials of a region, igniting students' interest in exploring and embracing their cultural heritage [34]. As a result, researchers have developed teaching materials in e-worksheets with the topic "Why do we need to eat and drink?" to enhance the NoS and environmental awareness among fifth-grade elementary school students, drawing on ethnoscience principles. This approach aims to simplify and contextualize learning, allowing students to engage more deeply with their surroundings' cultural, social, and environmental aspects. By doing so, students acquire practical abilities, skills, and knowledge that are beneficial for themselves and society. Additionally, this approach instills attitudes and behaviors aligned with regional values and norms, fostering the preservation of local culture and cultivating national character. Moreover, it empowers students to safeguard national and regional cultures, playing a vital role in shaping their character.

Research related to ethnoscience-based e-worksheets has been conducted, including STEM-based chemistry e-worksheets with ethnoscience content [35], the development of ethnoscience-based e-worksheets in science subjects [36], the development of ethnoscience-based e-worksheets to enhance science literacy [37], analysis of the need for high order thinking skills-based e-worksheets [38], and the design and testing of ethnoscience-laden e-worksheets [39]. However, there has yet to be research examining the need for ethnoscience-based e-worksheets to enhance NoS and environmental awareness.

This study aims to investigate the need for ethnoscience-based e-worksheets to enhance NoS and environmental awareness among elementary school students. Previous research has analyzed the need for e-worksheets, but not based on ethnoscience. Therefore, this research fills the existing gap, considering cultural aspects and the learning process as interesting topics for scholarly study.

Contribution to the Literature

This research contributes to:

- Identifying and addressing gaps in existing literature by exploring the utilization of local cultural contexts in science education, offering new perspectives on the application of ethnosciences in education.
- Providing practical recommendations for developing more relevant and meaningful teaching materials for students by integrating cultural and local environmental aspects into the learning process.

2. METHOD

The research employed the research and development (R&D) methodology. Within R&D methodologies, various models exist. The 4D development model is utilized in this study, as depicted in Figure 1. The 4D development model is a framework for creating a wide range of learning media and instructional materials. It comprises four primary stages: Define, Design, Develop, and Disseminate [40]. The chosen method and model were specifically selected to yield a product in the form of an ethnoscience-based E-Worksheet. This study is situated in the early stages of development, necessitating a development research design. The scope of this research is confined to a needs assessment aimed at conducting an initial analysis for developing a science learning model based on local wisdom through an ethnoscience learning approach. The research encompasses five

elementary schools in Bandar Lampung, chosen for their heterogeneity and diverse learning environments.

The research and development endeavor yielded theoretically and empirically feasible E-Worksheet teaching materials based on Ethnoscience. This process adhered to the 4D model (Define, Design, Develop, Disseminate) [41]. The primary stages of the 4D model serve as the guiding framework for this research and development endeavor. The adapted procedure for E-Worksheet development, following the 4D model, is depicted in Figure 1.

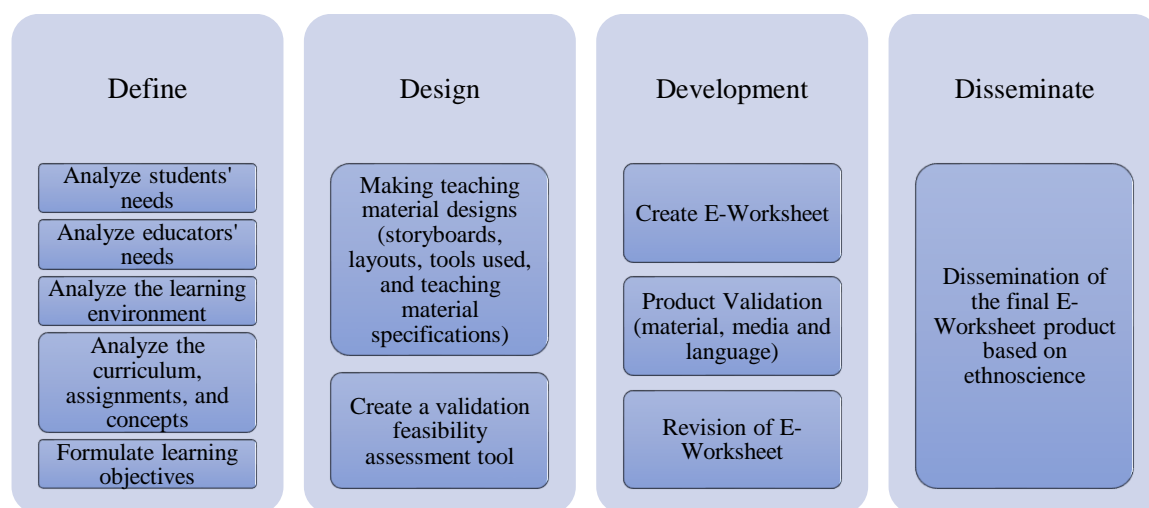


Figure 1. Research stages

3. RESULTS AND DISCUSSION

The initial stage (Define) in the 4D model involves defining development requirements, essentially serving as the needs analysis stage. This phase is crucial for identifying what is necessary for learning and gathering information pertinent to the product under development. In the context of the schools targeted in this research, the school environment already supports the learning process. Thus, the definition stage determines the school's needs and gathers information relevant to the products developed in the learning process. Through observations conducted at schools to gather information regarding necessary products, it was found that there was a lack of teaching material facilities related to science and science learning based on local wisdom and community culture. This led researchers to determine the product to be developed in this research, namely an E-Worksheet based on ethnoscience. Ethnoscience-based E-Worksheet is particularly suitable as research material because ethnoscience serves as a strategy for creating a learning environment and designing learning experiences that integrate culture as part of the learning process in elementary schools. Integrating ethnoscience in learning clearly depicts the uniqueness of teaching materials, classrooms, learning environments, methods, and approaches.

Integrating ethnoscience into learning themes can significantly enhance the effectiveness of the learning process. For instance, cultural knowledge about traditional rituals, medicinal plants, houses, and other relevant cultural aspects can serve as the main learning theme. This aligns with research findings indicating that ethnoscience integration enhances learning outcomes. For instance, research by Davison & Miller on American Indian students revealed that integrating ethnoscience into learning enabled students to derive meaning from mathematics and science concepts. Students exhibit better

comprehension of material when it is connected to cultural knowledge. This is consistent with Vygotsky's theory, which underscores the importance of interpersonal (social), cultural-historical, and individual factors in human development. Cognitive advancements occur within the Zone of Proximal Development (ZPD) when teachers and students utilize cultural tools and engage in cultural mediation, leading to cognitive changes as students internalize these interactions [19].

Furthermore, research findings from Gallagher in the domain of Environmental Education & Science Culture among Americans revealed that ethnoscience aimed to enrich knowledge in science program planning, teacher education, research, and school curricula. Various culturally rooted ideas for learning were offered within schools as a result [2]. The research findings underscore five pivotal points. Firstly, collaborative learning, intertwining culture, cognition, and the science of learning, emerges as a potent catalyst for improving student learning outcomes. Secondly, ethnoscience-based teaching strategies, emphasizing observation, problem-solving, and student-led discovery, prove effective in achieving educational objectives. Thirdly, ethnoscience integration extends beyond elementary science to encompass subjects like ecology, marine fisheries, and general science education. Fourthly, teachers benefit from ethnoscience integration by gaining insights into their students' diverse cultures. Finally, students are afforded opportunities for both individual and group projects, fostering holistic learning experiences. These findings emphasize the importance of integrating ethnoscience into elementary education, especially considering that elementary students undergo significant cognitive development, transitioning from perception-dominated thinking to utilizing experiences as cognitive references, thus enhancing comprehension and reducing confusion.

3.1 Define

The definition of the needs analysis stage can be conducted by analyzing previous research and literature studies. Thiagarajan identified five activities that can be undertaken during this defining stage [40], which include:

3.1.1 Initial Analysis

The initial final analysis step is employed to identify fundamental issues in product development. Basic problems encountered in the learning process are identified and delineated through initial analysis, underscoring the imperative for development [40]. At this stage, researchers conduct preliminary and final analyses to identify teachers' fundamental challenges in enhancing their performance during the learning process. This involves analyzing the teaching materials utilized by students and the learning strategies typically employed by teachers. Through this initial analysis, researchers understand the facts and potential solutions, aiding in the selection and determination of learning tools to be developed. Data for the initial to final analysis is obtained through the distribution of needs analysis questionnaires to students and teachers across five elementary schools in Bandar Lampung. The results of this initial analysis are further explored through questionnaires distributed to 17 science and science teachers within these schools. Field studies are conducted to ascertain the needs of both teachers and students regarding the utilization of teaching materials in the form of an ethnoscience-based E-Worksheet. The findings from the needs analysis for ethnoscience-based interactive multimedia serve as the foundation for developing products that align with the identified needs in the field. The needs analysis for ethnoscience-based E-Worksheet by teachers is presented in Table 1.

Table 1. Analysis of teachers' needs for ethnoscience-based e-worksheet

No	Statement	Response	Percentage (%)
1	Teaching materials commonly used in teaching	Module Worksheet	95% 95%
2	Teachers who have employed digital teaching resources	Once	25%
3	Varieties of digital teaching resources that have been utilized	E-Books PPT Videos	50% 25% 50%
4	How teachers obtain electronic teaching materials	Self-creation School-provided Download	5% 10% 85%
5	Teachers who have participated in workshops or training sessions focused on creating digital teaching resources.	Once	25%
6	Teachers' perspectives on the significance of developing electronic teaching materials (E-Worksheet) grounded in ethnoscience	Yes	100%
7	Educators express interest in the development of E-Worksheets based on ethnoscience.	Yes	100%
8	The essential requirement to incorporate ethnoscience-based E-Worksheets into the learning process	Yes	95%

According to the findings from the needs analysis of ethnoscience-based E-Worksheets by teachers, as outlined in Table 1, a wide range of teaching materials is being utilized, including textbooks, student worksheets, blackboards, charts, environmental media, internet resources, and PowerPoint presentations. Many teachers have incorporated electronic teaching materials into their teaching practices, with PowerPoint presentations and instructional videos being the most commonly used. The widespread use of E-Worksheets in the learning process suggests their potential to facilitate students' rapid and efficient absorption of information, aiding in acquiring knowledge that may be challenging to obtain through direct experience [42]. Most teachers utilize E-Worksheets in diverse manners, including accessing them from school resources, downloading them from the internet, and creating their own. However, most teachers opt to download E-Worksheets from the internet due to this approach's convenience and time-saving nature.

The creation of E-Worksheets by teachers is notably limited, primarily due to the lack of training opportunities in developing interactive multimedia, as well as constraints related to age and time availability. Most teachers have not undergone workshops or training sessions on creating interactive multimedia, and factors such as age and time constraints further hinder their ability to develop customized materials aligned with their teaching methods. Nevertheless, integrating E-Worksheets into classroom learning processes can significantly enhance student learning outcomes [43]. Relying solely on interactive multimedia may not fully optimize the learning process. Many online teaching materials fail to connect the content to everyday life, leaving students feeling disconnected and perceiving the learning as irrelevant. Science education, closely intertwined with students' daily experiences, can benefit greatly from integrating local and national cultural aspects. Incorporating ethnoscience into the curriculum is essential as it bridges the gap between academic content and real-life experiences. However, it is uncommon for teachers to effectively integrate students' cultural traditions into their subjects.

Based on the teacher needs questionnaire analysis, it was found that 50% of teachers have utilized E-Worksheets focused on "why we need to eat and drink," with half indicating that these materials were self-created. Only 20% of teachers reported involving students in every aspect of the learning process, highlighting a significant portion of educators who do not engage students in science learning. Additionally, 25% of teachers

stated that the E-Worksheets used did not effectively enhance students' knowledge literacy or increase environmental awareness. Interestingly, a quarter of teachers relied on E-Worksheets from social media platforms, attributing this to a lack of motivation and innovation in supporting the learning process. Notably, 100% of teachers had never encountered the term "ethnoscience." Similarly, none knew that science learning could be interconnected with cultural customs, particularly concerning why we need to eat and drink. Based on these findings, it is evident that 85% of teachers express a need for ethnoscience-based E-Worksheet teaching materials related to the significance of why we need to eat and drink, aiming to enhance students' understanding of science and increase environmental awareness.

3.1.2 Student Analysis

Student analysis involves identifying the characteristics of the target students for developing learning tools. It provides insights into the challenges students face related to the material, teaching materials, and strategies used in the learning process. This analysis is conducted through the distribution of needs questionnaires, aiming to uncover the issues students encounter during science learning. Educators gain a comprehensive understanding of student needs by examining students' responses to science lessons and their interaction with learning materials and understanding their preferred learning styles, interests, and motivations. Additionally, interviews with educators are conducted to assess students' levels of environmental awareness. Findings reveal a lack of environmental consciousness among students, as evidenced by littering, vandalizing school property, neglecting plant care, relying on instant food, and disregarding hand hygiene. Moreover, a disconnect is observed between indigenous science and formal education, with teachers failing to integrate local wisdom from Lampung into the curriculum.

Table 2. Analysis of students' needs for ethnoscience-based e-worksheet

No	Statement	Response	Percentage (%)
1	Instructional resources typically employed by teachers during lessons	Modules	90%
		Worksheet	50%
		Whiteboards	70%
2	Teachers use electronic teaching resources	Once	50%
3	The equipment utilized for presenting digital teaching materials	PPT	75%
		Flash Media	5%
		Videos	80%
		E-Module	25%
		E-Worksheet	5%
4	Digital teaching resources are engaging for educational purposes	Very interesting	85%
		Interesting	10%
		Quite interesting	5%
		Not attractive	0%
5	Students have been instructed with content grounded in local wisdom	Once	65%
		Never	35%
6	The necessity of incorporating electronic teaching materials (E-Worksheets) infused with local wisdom into the learning process	Yes	98%

According to Table 2, the analysis of students' needs for ethnoscience-based E-Worksheets reveals that teachers employ diverse teaching materials, including books, student worksheets, and blackboards. Nearly all students have been exposed to electronic teaching materials provided by their teachers. The utilization of electronic media in teaching, such as e-modules and e-books, is prevalent among many educators. Incorporating electronic teaching materials infused with local wisdom is essential in

learning, as it facilitates students' comprehension of abstract concepts. Furthermore, using E-Worksheets is considered superior to other materials due to their interactive nature and effectiveness in enhancing learning outcomes. This aligns with previous research, which indicates that integrating interactive multimedia into classroom learning can significantly enhance student learning outcomes compared to relying solely on PowerPoint presentations [44].

The analysis of the student needs questionnaire revealed that 30% of students have utilized E-Worksheets, with only 25% specifically mentioning the use of E-Worksheets related to why we need to eat and drink. Moreover, 80% of students reported that the E-Worksheets used in learning did not incorporate Lampung cultural traditions. In comparison, 90% felt these materials did not effectively enhance scientific literacy and environmental awareness. Consequently, students express a need for teaching materials that are more innovative, versatile, culturally relevant, and capable of promoting scientific literacy. In light of this, 90% of students agree that developing ethnoscience-based E-Worksheets focusing on why we need to eat and drink is crucial for enhancing the NoS and environmental awareness.

Science learning encompasses both tangible concepts related to everyday life and abstract principles. E-worksheets serve as effective tools to elucidate these abstract concepts by illustrating them vividly, simulating real-world processes, and aiding teachers in guiding students to grasp these concepts more effectively [45], [46]. In addition to employing interactive multimedia, educational materials must be intertwined with everyday experiences, aiding students in better retention. The majority of educators have incorporated teaching materials that are intricately connected to the local cultural context. Local culture is deeply embedded in everyday life, and the learning process rooted in local culture extends beyond the mere transmission of cultural knowledge. It involves leveraging local culture to empower students in crafting significance, pushing the boundaries of imagination and creativity, thus facilitating a profound understanding of the subject [47], [48]. This underscores the significance of integrating E-Worksheets infused with local culture, as it captures students' interest and warrants further development for integration into the learning process.

The analysis of the student needs questionnaire revealed that 30% of students had utilized E-Worksheets, with only 25% specifically mentioning the use of E-Worksheets related to why we need to eat and drink. Additionally, 80% of students expressed that the E-Worksheets used in learning did not showcase Lampung cultural traditions. In comparison, 90% felt these materials did not effectively enhance scientific literacy and environmental awareness. Consequently, students are calling for teaching materials that are more innovative, versatile, culturally relevant, and capable of promoting scientific literacy. In light of this, 90% of students agree that developing ethnoscience-based E-Worksheets focused on why we need to eat and drink is essential for improving the NoS and environmental awareness.

3.1.3 Task Analysis

Task analysis is conducted to identify the content to be incorporated into teaching materials. Its objective is to pinpoint the skills investigated by researchers and subsequently dissect them into a series of supplementary skills that might be required [40]. In this scenario, researchers analyze the primary tasks students must master to attain the specified minimum competencies. This ensures students can effectively receive and comprehend the material. Task analysis is conducted to outline the tasks that students must accomplish and categorize them based on the learning implementation. In this E-

Worksheet, the tasks assigned have been formulated according to competency achievement indicators outlined in the teaching module.

3.1.4 Concept Analysis

Concept analysis was conducted to ascertain the content of the ethnoscience-based E-Worksheet material under development. This process involved identifying the primary concepts to be imparted, organizing them hierarchically, and delineating individual concepts into critical and non-essential ones [40]. Concept analysis serves as a crucial step in adhering to the principles of constructing concepts within educational materials, acting as a vehicle to attain learning objectives and assess student's knowledge and skills as foundational competencies essential for the learning journey. The scientific material under consideration is outlined in the following table.

Table 3. Topic B learning outcomes

Teaching Topic B: Why Do We Need to Eat and Drink?			
Learning Outcomes	Meaningful Understanding	Indicator NoS	Indicators Environmental Awareness
Students engage in simulations utilizing simple pictures, charts, tools, and media to explore the organ systems of the human body, including the respiratory, digestive, and circulatory systems. These simulations are intertwined with instructions on how to effectively maintain the health of the body's organs.	1. Students are acquainted with the terminology and sequential process of human digestion.	1. Students can interpret scientific data and evidence.	1. Participants are instructed to understand how food and beverages contribute to our vitality and activity levels.
	2. Students grasp the functions of each organ involved in food processing until its eventual excretion in feces.	2. Students are capable of providing explanations.	2. Participants are instructed to understand the workings of the digestive system in processing the food and beverages they consume.
	3. Students are aware of the food substances ingested by the body.	3. Scientific phenomena	3. Students are familiar with healthy eating patterns and the characteristics of nutritious food and beverages.
	4. Students are familiar with nutritious foods suitable for consumption to uphold a healthy body.	4. Students can design scientific inquiry	4. Participants are taught how to maintain a healthy digestive system
	5. Students are capable of implementing a balanced diet in their everyday lives.	5. scientific inquiry	5. Participants are taught to know medicinal plants to treat diseases in the digestive system
		6. Students can evaluate scientific inquiry	6. Students understand the significance of preserving local wisdom to demonstrate respect and empathy.

3.1.5 Specifying Instructional Objectives

Based on the analytical tasks and concept analysis, the current stage involves determining indicators aligned with learning achievements outlined in the independent curriculum. Formulating learning objectives consolidates the outcomes of concept analysis and task analysis, aiming to specify the expected behaviors of the research subjects [40]. This summary serves as the fundamental groundwork for crafting assessments and designing future learning tools beyond delineating the learning material to be employed. The specification of learning objectives, derived from material analysis, entails envisioning the anticipated student outcomes post-learning process.

Table 4. Learning objectives for topic B

Teaching Topic B: Why Do We Need to Eat and Drink?	
Topic B Learning Objectives	Essential Questions
1. Students can describe the digestive process in humans.	1. How do food and drink help us stay alive and active?
2. Students can apply a balanced diet in their daily lives.	2. How does the digestive system process the food and drinks we consume? 3. What constitutes a nutritious diet, and what are the characteristics of healthy food and beverages?

3.2 Design

The second phase in the 4D model is the design stage. This phase involves four essential steps: establishing test criteria, selecting appropriate media, choosing formats, and initiating design, as outlined by Thiagarajan. During this stage, the design process begins with selecting media and formats, followed by the actual design of the chosen media. In this research, the developed media is an ethnoscience-based E-Worksheet. The designed E-Worksheet will encompass natural and social sciences content, integrated with local cultural knowledge, particularly ethnoscience from the Lampung region.

3.2.1 Creating Criterion-Referenced Tests (Preparation of Test Standards)

Preparing test standards is crucial to bridging the definition stage with the design stage. It involves creating test instruments based on the specifications of learning objectives and student analysis. Starting with a question grid, scripts for pretest and posttest questions are prepared to assess students' abilities. The post-test results serve as indicators of students' NoS and environmental awareness. Before assessing students, the test instrument undergoes testing to ensure the validity and reliability of the questions.

3.2.2 Media Selection

Media selection is crucial to identifying learning tools suitable for the material's characteristics. It is based on the outcomes of concept and task analyses, student characteristics, and distribution plans across various media. The selection process prioritizes optimizing the use of teaching materials during development. In this study, researchers will focus on crafting E-Worksheets to enhance students' NoS and environmental awareness.

3.2.3 Format Selection

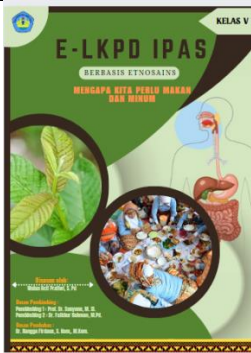
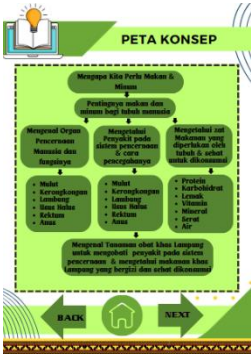


In crafting learning tools, the format outlines the design of learning media and selecting strategies, approaches, methods, and learning resources. In this study, an ethnoscience approach was employed to develop teaching materials in the form of E-Worksheets. The process commenced with researchers conceptualizing and constructing the E-Worksheet natural and social sciences and designing its visual layout. Researchers generated learning content, including pretests, materials on why we need to eat and drink for each learning activity, learning videos, and posttests.

3.3.3 Initial Design

Thiagarajan emphasized that the initial design represents the comprehensive blueprint of the learning tool that must be finalized before testing is initiated [40]. At this stage, various structured learning activities are incorporated, along with diverse learning skills through teaching practices, such as Microteaching. This encompasses preparing evaluation tools for teaching materials, including expert validation questionnaires and

student response questionnaires. These tools help ascertain the suitability of the E-Worksheet teaching materials developed by researchers. During the design phase, researchers generate an initial product or prototype, an ethnoscience-based E-Worksheet designed to enhance students' NoS and environmental awareness, as seen in this storyboard.

Table 5. Storyboard prototype e-worksheet

No	Section	Description
1		Cover
2		Concept map
3		Learning Activity Part 1
4		Ethnoscience of Lampung typical food

5



Learning activity part 2

6



Learning Activity Part 3

7



Ethnoscience of Lampung typical medicinal plants

8



Competency test

In the E-Worksheet development process, the cover image serves as the initial visual introduction, featuring essential details such as the title, depiction of the digestive system, and insights into Lampung's traditional medicines and foods. Additionally, it includes acknowledgments to the developer, supervisors, and discussants involved in the project. The Concept Map presents a graphical representation elucidating the interconnectedness between healthy foods and the human digestive system, aiding in conceptual understanding. Subsequent sections, such as Learning Activities 1, 2, and 3, provide

engaging content on the importance of proper nutrition, digestive system functions, and strategies for preventing disorders. Each activity incorporates informative videos to enhance comprehension. The Ethnoscience segments on Lampung's typical food and medicinal plants offer insights into indigenous knowledge and its applications in health and wellness. Finally, the Competency Test evaluates students' learning outcomes, integrating questions aligned with scientific indicators and practical assignments to gauge environmental awareness. Through this comprehensive approach, the E-Worksheet aims to foster holistic learning experiences for students.

Building upon the insights gathered from preliminary studies and relevant research, this study endeavors to create educational resources in the format of an ethnoscience-based E-Worksheet focusing on why consuming food and beverages is essential. This educational material will be imbued with the cultural heritage of the Lampung region, thereby integrating indigenous knowledge into the learning process. Specifically, the content will explore the significance of dietary habits through the lens of ethnoscience, incorporating learning activities centered around traditional Lampung cuisine and medicinal plants used to address digestive ailments. Intertwining scientific concepts with Lampung's local wisdom aims to enhance students' comprehension of scientific principles while fostering an appreciation for their cultural heritage.

The findings of this study align with prior research conducted by Rahma Sahara et al., which focused on analyzing the requirements for developing an ethnoscience-based module about temperature and heat topics for Grade 9 students at SMAN Kota Bengkulu [34], and research conducted by Kurniawan indicates that the integration of ethnosciences in instructional media can fulfill the needs and conditions of students, as well as support independent and scientific learning [49]. Moreover, ethnoscience serves as a strategic approach to establish a learning milieu and craft learning encounters by amalgamating culture into the educational process at elementary schools. Integrating ethnoscience into education makes it feasible to distinctly illustrate the nuances of teaching resources, classrooms, learning environments, instructional strategies, and culturally-based learning approaches. The educational process becomes more efficacious when ethnoscience is infused into the primary learning theme. Examples of culturally relevant knowledge encompass traditional houses, traditional medicinal plants, and traditional rituals [50].

Furthermore, leveraging community knowledge as a learning asset for students [51] can enhance learning outcomes across all dimensions of science, encompassing attitudes and scientific skills [52]. This approach can also foster critical thinking among students, as evidenced by previous research that promotes the development of students' character, particularly about local culture [53], [54]. Additionally, learning with ethnoscience has been shown to instill local wisdom values [55], and utilizing local cultural elements can serve as an effective learning resource in elementary schools [56].

Students' needs underscore the necessity for the development of E-Worksheets. This aligns with findings from research conducted by Fiteriyani, which highlights the manifold positive impacts of using ethnoscience-based E-Worksheets on students' learning progression. These impacts include enhancements in student learning outcomes and motivation and the provision of lessons concerning local cultural values. Given that students' cultural backgrounds can influence their learning styles, such materials can create a learning environment that resonates with students' lived experiences, thereby fostering the development of local cultural character. Additional research corroborates the influence of using Learning Kits and Devices (worksheets) employing an ethnoscience approach to enhancing student learning outcomes [56].

A limitation of this research is that the ethnoscience-based E-Worksheet being developed will focus solely on topic B, phase C, addressing why we need to eat and drink. However, this research is anticipated to be a valuable resource for teachers and students in creating and utilizing ethnoscience-based E-Worksheets for other material content in the elementary school curriculum.

4. CONCLUSION

Based on the findings derived from the analysis and discussion of data collected from five elementary schools in Bandar Lampung, it is evident that 85% of teachers expressed a need for ethnoscience-based E-Worksheet teaching materials focusing on the importance of why we need to eat and drink, aimed at enhancing students' NoS and environmental awareness. Moreover, the results of student analysis, as per the student needs questionnaire, revealed that 95% of students concurred that the development of an ethnoscience-based E-Worksheet is intended to elevate their understanding of NoS and environmental awareness concerning the topic of why we need to eat and drink.

AUTHOR CONTRIBUTION STATEMENT

WOP contributed to compiling and designing experiments, conducting experiments, analyzing and interpreting data, and writing articles. S contributed to improving and providing input on the research manuscript. FR contributed to improving and providing input on the research manuscript. RF contributed to improving and providing input on the research manuscript.

REFERENCES

- [1] NSTA, "Transitioning from scientific inquiry to Three-Dimensional teaching and learning," *Am. Biol. Teach.*, vol. 2, no. 3, pp. 176–179, 2018.
- [2] G. H. Boran and H. Bağ, "The influence of argumentation on understanding nature of science," *Int. J. Environ. Sci. Educ.*, vol. 11, no. 6, pp. 1423–1431, 2016.
- [3] Y. Soysal, "A Critical Review : Connecting nature of science and argumentation," *Sci. Educ. Int.*, vol. 25, no. 4, pp. 501–521, 2015.
- [4] D. Hogan and J. O'Flaherty, "Exploring the nature and culture of science as an academic discipline: implications for the integration of education for sustainable development," *Int. J. Sustain. High. Educ.*, vol. 23, no. 8, pp. 120–147, 2022, doi: <https://doi.org/10.1108/IJSHE-06-2021-0236>.
- [5] N. G. Lederman, J. S. Lederman, and A. Antink, "Nature of science and scientific inquiry as contexts for the learning of science and achievement of scientific literacy," *Int. J. Educ. Math. Sci. Technol. Int. J. Educ. Math. Sci. Technol. Int. J. Educ. Math. Sci. Technol.*, vol. 1, no. 3, pp. 138–147, 2013.
- [6] M. E. Imran and A. Wibowo, "Profil pemahaman nature of science (NNOS) di sekolah dasar," *JKPD (Jurnal Kaji. Pendidik. Dasar)*, vol. 3, no. 2, pp. 540–557, 2018, doi: <https://doi.org/10.26618/jkpd.v3i2.1420>.
- [7] O. Sengul, "Pre-service mathematics teachers' views of nature of science in the context of COVID-19," *Eur. J. Sci. Math. Educ.*, vol. 11, no. 3, pp. 499–514, 2023, doi: <https://doi.org/10.30935/scimath/12982>.
- [8] I. D. G. Agung, I. N. Suardana, and N. K. Rapi, "E-modul IPA dengan model STEM-PjBL berorientasi pendidikan karakter untuk meningkatkan hasil belajar siswa," *J. Imiah Pendidik. dan Pembelajaran*, vol. 6, no. 1, pp. 120–133, 2022, doi: <https://doi.org/10.23887/jipp.v6i1.42657>.
- [9] P. H. Eastwell, "the Nature of Science," *J. Chem. Educ.*, vol. 14, no. 3, pp. 201–

- 215, 2002, doi: <https://doi.org/10.1111/j.1467-9744.1979.tb00357.x>.
- [10] W. F. McComas, "The principal elements of the nature of science: dispelling the myths," *Nat. Sci. Sci. Educ.*, vol. 5, no. 1986, pp. 53–70, 2019, doi: https://doi.org/10.1007/0-306-47215-5_3.
- [11] N. Hardianty, "Nature of Science : Bagian penting dari literasi sains," *Pros. Simp. Nas. Inov. dan Pembelajaran Sains 2015 (SNIPS 2015)*, Bandung, Indonesia, 2015, pp. 441–444.
- [12] N. T. önal and A. S. eryaşar, "Exploring pre-service pre-school teachers' perceptions of the nature of science: A qualitative study," *J. Teach. Educ. Lifelong Learn.*, vol. 4, no. 2, pp. 163–180, 2022, doi: <https://doi.org/10.51535/tell.1190960>.
- [13] S. BouJaoude, A. Ambusaidi, and S. Salloum, *Teaching nature of science with multicultural issues in mind: the case of Arab countries*. New York : Springer, 2021.
- [14] N. N. Fauziah and G. Hamdu, "Elektronik-lembar kerja peserta didik berbasis ESD di sekolah dasar," *Attadib J. Elem. Educ.*, vol. 6, no. 1, pp. 63-78, 2022, doi: <https://doi.org/10.32507/attadib.v6i1.1152>.
- [15] R. Kristyowati, "Lembar kerja peserta didik (LKPD) IPA sekolah dasar berorientasi lingkungan," *Pros. Semin. dan Disk. Nas. Pendidik. Dasar 2018*, 2018, pp. 282–288.
- [16] J. S. Amtonis, "E-LKPD dan literasi lingkungan pada pendidikan era revolusi industri 4.0," *J. Koul.*, vol. 5, no. 1, pp. 71–80, 2022, doi: <https://doi.org/10.51158/koulutus.v5i1.786>.
- [17] G. A. Lestari and S. H. Nur, "Desain lembar kerja peserta didik (LKPD) materi pencemaran lingkungan berbasis penelitian pengolahan sampah menggunakan alat hermatica illucienses untuk meningkatkan kesadaran dan literasi lingkungan," vol. 14, no. 1, pp. 176–189, 2023, doi : <https://doi.org/10.31943/gw.v14i1.393>.
- [18] D. Melawati and F. Istianah, "Pengembangan modul berbasis etnosains pada pembelajaran IPA materi ekosistem kelas V sekolah dasar," *Jpgsd*, vol. 10, no. 4, pp. 709–722, 2022, doi : <https://doi.org/10.46368/jpd.v10i1.413>.
- [19] J. Skovsgaard et al., *The future of education and skills: education 2030*. Paris : OECD, 2018.
- [20] Y. F. Andini, R. Fitri, and Y. L. Rahmi, "Pengembangan modul pembelajaran berbasis etnosains pada mata pelajaran biologi untuk meningkatkan kemampuan literasi sains peserta didik: literatur review," *Spizaetus J. Biol. dan Pendidik. Biol.*, vol. 3, no. 3, pp. 72-79, 2022, doi: <https://doi.org/10.55241/spibio.v3i3.70>.
- [21] J. Krajhanzl, "Environmental and proenvironmental behavior," *Sch. Heal. Heal. Educ. Int. Exp.*, vol. 21, pp. 251–274, 2010.
- [22] S. H. Voon and M. S. Amran, "Pengaplikasian teori pembelajaran konstruktivisme dalam pembelajaran matematik," *Sains Insa.*, vol. 6, no. 2, pp. 421–438, 2021, doi: <https://doi.org/10.33102/sainsinsani.vol6no2.285>.
- [23] D. E. Silalahi et al., *Literasi Digital Dalam Lingkungan Sekolah (Teori, Praktek, dan Penerapannya)*. Padang : Global Eksekutif Teknologi, 2022.
- [24] E. Anggereini, J. Siburian, and A. Hamidah, "Identification of project based learning and STEM PjBL innovation based on socio scientific issues as an effort to improve students' scientific literacy," *J. Pendidik. Sains Indones.*, vol. 11, no. 1, pp. 165–177, 2023, doi: <https://doi.org/10.24815/jpsi.v11i1.26927>.
- [25] I. Gede, D. Juni Pratama, N. Dantes, and K. Yudiana, "Thematic learning plan with a nature of science learning model in the fourth grade of elementary school," *Int. J. Elem. Educ.*, vol. 4, no. 4, pp. 447–453, 2020.
- [26] W. P. S. One, "Development electronic module as a media subject matter integers

- and fractions mathematics of class VII SMP negeri 1 Pamekasan,” *J. Univ. Negeri Surabaya*, vol. 3, no. 1, pp. 1-8, 2017.
- [27] I. Inzghi, F. C. Wibowo, and V. Serevina, “E-modul berbasis project based learning (PJBL) terintegrasi science , technology , engineering , mathematic (STEM) pada,” vol. 11, no. 1, pp. 335–340, 2023, doi : <https://doi.org/10.21009/03.1102.PF46>.
- [28] S. Latifah, M. Meisuri, and A. A. Kesuma, “Development of physics worksheet based on higher order thinking skills (HOTS) integrated with pengembangan lembar kerja fisika berbasis higher order thinking skills (HOTS) terintegrasi pembelajaran kelas bilingual,” *Indones. J. Sci. Math. Educ.*, vol. 6, no. 1, pp. 82–95, 2023, doi: <https://doi.org/10.24042/ij sme.v6i1.14131>.
- [29] Y. Nurmalisa, S. Sunyono, D. Yulianti, and R. M. Sinaga, “An integrative review : application of digital learning media to developing learning styles preference,” vol. 13, no. 1, pp. 187–194, 2023, doi: <https://doi.org/10.18178/ijiet.2023.13.1.1795>.
- [30] H. Mukti, I. W. Suastra, and I. B. P. Aryana, “Integrasi etnosains dalam pembelajaran IPA,” *JPGI (Jurnal Penelit. Guru Indones.)*, vol. 7, no. 2, pp. 356–362, 2022.
- [31] B. Sunyono, Viyanti, and U. Efendi, "Reinforcement on Students ' Scientific Literacy : Development of Worksheet Based Lynk," *Proceedings of the 3rd Universitas Lampung International Conference on Social Sciences (ULICoSS 2022)* 2022, pp. 139–150.
- [32] Fitriyeni, “Pengembangan LKPD digital berbasis etnosains melayu Riau pada muatan IPA sekolah dasar,” *J. Basicedu*, vol. 5, no. 5, pp. 3829–3840, 2021.
- [33] C. Damayanti, A. Rusilowati, and S. Linuwih, “Pengembangan model pembelajaran IPA terintegrasi etnosains,” *J. Innov. Sci. Educ.*, vol. 6, no. 1, pp. 116–128, 2017.
- [34] R. Sahara, H. Johan, and dan R. Medriati, “Analisis kebutuhan pengembangan modul berbasis etnosains materi suhu dan kalor kelas XI SMAN kota Bengkulu,” *J. Ilm. Pendidik. Fis.*, vol. 6, no. 3, pp. 36–41, 2022, doi : <https://doi.org/10.20527/jipf.v6i3.6459>.
- [35] N. M. A. Suparwati, I. W. Suja, and I. N. Tika, “E-LKPD kimia berbasis STEM dengan muatan etnosains untuk meningkatkan model mental kimia pada materi laju reaksi,” *J. Pendidik. Kim. Undiksha*, vol. 7, no. 1, 2023.
- [36] F. Fitriyeni, “Pengembangan LKPD digital berbasis etnosains melayu Riau pada muatan IPA sekolah dasar,” *J. Basicedu*, vol. 7, no. 1, pp. 441–451, 2023, doi : <https://doi.org/10.31004/basicedu.v7i1.4399>.
- [37] E. R. Pratiwi, “Pengembangan E-LKPD berbasis etnosains model inkuiri terbimbing untuk meningkatkan literasi sains peserta didik,” in *Prosiding Seminar Nasional Kimia*, 2023, pp. 62–72.
- [38] A. Hasanah, “Analisis kebutuhan pengembangan E-LKPD berbasis HOTS berbantuan liveworksheet untuk peserta didik sekolah dasar,” *J. Elem. Edukasia*, vol. 6, no. 4, pp. 1818–1827, 2023, doi : <https://doi.org/10.31949/jee.v6i4.7222>.
- [39] D. Silviani, “Desain dan uji coba lembar kerja peserta didik elektronik (E-LKPD) bermuatan etnosains berbasis literasi sains pada materi hidrokarbon.” B.S. Thesis, Dept. Educ. and Teach., Universitas Islam Negeri Sultan Syarif Kasim Riau, Indonesia, 2021.
- [40] D. Lawhon, “Instructional development for training teachers of exceptional children: A sourcebook,” *J. Sch. Psychol.*, vol. 14, no. 1, pp. 75-85, 1976, doi: [https://doi.org/10.1016/0022-4405\(76\)90066-2](https://doi.org/10.1016/0022-4405(76)90066-2).
- [41] R. M. Branch, *Approach, instructional design: The ADDIE*. New York : Springer,

- 2009.
- [42] M. T. Student *et al.*, “Mengukur keefektifan teori konstruktivisme dalam pembelajaran,” *Front. Neurosci.*, vol. 14, no. 1, pp. 1–13, 2021.
- [43] S. N. Hidayati, S. Sunyono, and L. Sabdaningtyas, “Inquiry-based E-LKPD in effort to improve the fourth grade students’ learning outcome,” *Int. J. Educ. Stud. Soc. Sci.*, vol. 1, no. 3, pp. 129–132, 2021, doi: <https://doi.org/10.53402/ijesss.v1i3.28>.
- [44] R.S. Pertiwi, “Pengembangan lembar kerja siswa dengan pendekatan STEM (Science, Technology, Engineering, Mathematics) untuk melatih keterampilan berpikir kreatif siswa pada materi fluida statis,” B.S. Thesis, Dept. Educ. and Teach., Univeristas Lampung, Indonesia, 2017.
- [45] S. N. Pratiwi, C. Cari, and N. S. Aminah, “Pembelajaran IPA abad 21 dengan literasi sains siswa,” *J. Mater. dan Pembelajaran Fis.*, vol. 9, no. 1, pp. 34–42, 2019.
- [46] N. L. G. K. Widiastuti and D. A. M. M. O. Priantini, “Lembar kerja peserta didik berbasis kontekstual pada muatan pelajaran IPA,” *J. Ilm. Pendidik. Profesi Guru*, vol. 5, no. 1, pp. 147–160, 2022, doi: <https://doi.org/10.23887/jippg.v5i1.45530>.
- [47] T. Totok, “Aktualisasi nilai-nilai kearifan lokal dalam pendidikan kewarganegaraan sebagai peneguh karakter kebangsaan,” *J. Pendidik. Kewarganegaraan*, vol. 8, no. 2, pp. 1–20, 2018.
- [48] I. U. Riwu, D. N. L. Laksana, and K. D. Dhiu, “Pengembangan bahan ajar elektronik bermuatan multimedia pada tema peduli terhadap makhluk hidup untuk siswa sekolah dasar kelas IV di kabupaten Ngada,” *J. Educ. Technol.*, vol. 2, no. 2, pp. 56-64, 2019, doi: <https://doi.org/10.23887/jet.v2i2.16182>.
- [49] R. Kurniawan, “Media analysis in the development of e-module based guidance inquiry integrated with ethnoscience in learning physics at senior high school,” *Journal of Physics: Conference Series*, vol. 1481, no. 1, pp. 1-4, 2020. doi: <https://doi.org/10.1088/1742-6596/1481/1/012062>.
- [50] Y. Wahyu, “Pembelajaran berbasis etnosains di sekolah dasar [Ethnoscience-based learning in elementary schools],” *J. Inov. Pendidik. Dasar*, vol. 1, no. 2, pp. 140–147, 2017.
- [51] H. Mukti, B. F. Rahmawati, and M. M. Marzuki, “Kajian etnosains dalam ritual belaq tangkel pada masyarakat suku Sasak sebagai sumber belajar IPA,” *Educatio*, vol. 17, no. 1, pp. 41–53, 2022, doi: <https://doi.org/10.29408/edc.v17i1.5520>.
- [52] M. Syazali and U. Umar, “Peran kebudayaan dalam pembelajaran IPA di Indonesia: Studi Literatur Etnosains,” *J. Educ. FKIP UNMA*, vol. 8, no. 1, pp. 344–354, 2022, doi: <https://doi.org/10.31949/educatio.v8i1.2099>.
- [53] S. P. Sari, S. Mapuah, and I. Sunaryo, “Pembelajaran ilmu pengetahuan alam berbasis etnosains untuk mengembangkan kemampuan berpikir kritis siswa sekolah dasar,” *EduBase J. Basic Educ.*, vol. 2, no. 1, pp. 9-18, 2021, doi: <https://doi.org/10.47453/edubase.v2i1.284>.
- [54] Y. Andayani, Y. A. S. Anwar, and S. Hadisaputra, “Pendekatan etnosains dalam pelajaran kimia untuk pembentukan karakter siswa: tanggapan guru kimia di NTB,” *J. Pijar Mipa*, vol. 16, no. 1, pp. 39–43, 2021, doi: <https://doi.org/10.29303/jpm.v16i1.2269>.
- [55] A. Ilhami, D. Diniya, S. Susilawati, R. Sugianto, and C. F. Ramadhan, “Analisis kearifan lokal manongkah kerang di kabupaten Indragiri Hilir, Riau sebagai Sumber belajar IPA berbasis etnosains,” *Sos. Budaya*, vol. 18, no. 1, pp. 20-27, 2021, doi: <https://doi.org/10.24014/sb.v18i1.12723>.
- [56] M. Annisa, F. M. Abrori, H. Prastitasari, and A. Asrani, “Kajian etnosains berdasarkan aspek sosio-kultural pada lahan basah di Kalimantan Selatan (studi

etnobiologi dan potensinya dalam pembelajaran di sekolah dasar),” *J. Basicedu*, vol. 5, no. 6, pp. 5906–5915, 2021, doi: <https://doi.org/10.31004/basicedu.v5i6.1752>.