

Profile of Knowledge of Science Teacher Candidates on Ethnoscience-Based Science Learning

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Abstract. The study aims to explore the knowledge of prospective science teacher students about ethnoscience-based learning. This study is exploratory research carried out at three tertiary institutions organising biology education study programs: Mandalika Education University, Hamzanwadi University, and Mataram State Islamic University. The research respondents were 54 biology education students. The research instrument used is a closed questionnaire with answers using a Likert scale; experts have validated it. The research data were analysed using quantitative descriptive and inferential statistics using the ANOVA test. The results of this study are: 1) students of the Mandalika University of Education have an average score of student knowledge about ethnoscience-based learning of 2.29 in the Fair Good category, Hamzanwadi University students of 1.84 in the Fair Good category, Mataram State Islamic students of 2, 25 in the Fair Good category; 2) there is a significant difference in the knowledge of students at the Mandalika University of Education, Hamzanwadi University, and Mataram State Islamic University about ethnoscience-based learning, as evidenced by the results of the ANOVA test with a significance value of $0.007 > 0.05$.

Keywords: knowledge; learning science; ethnoscience

INTRODUCTION

The world is undergoing a significant transition, moving from the era of the Fourth Industrial Revolution into what is termed Civilization 5.0 [1]. According to [2], in the 21st century, there is a profound association with highly advanced information technology, which has opened up new avenues for global connectivity [3] and ushered in an era of disruption [4]. This increased accessibility to information has made it effortless for people of all backgrounds, including students, to tap into a wealth of foreign cultures and knowledge [5]. Consequently, this has led to a substantial assimilation of foreign cultural elements among the younger generation, potentially resulting in cultural acculturation that may dilute local and national traditions [6]. The prevailing perception among younger individuals that foreign cultures are more progressive and modern further amplifies this phenomenon, sparking their curiosity and fascination with these foreign

cultural paradigms. Therefore, it becomes imperative to instil a sense of cultural preservation among the younger generation through educational efforts [5]. This perspective is reinforced by the belief [7] that students require structured guidance and direction within the educational system to cultivate knowledge and values related to cultural preservation.

The rapid advancements in science and technology have given rise to societal dilemmas concerning cultural values and the field of science itself [8]. There appears to be a disconnect between local cultural values and the younger generation's engagement with them in today's world. This phenomenon can lead to cultural assimilation, where students become more familiar with foreign cultures than their regional heritage [9]. Authors [5] suggest that widespread exposure to foreign cultures primarily drives this acculturation rather than exposure to local culture. This situation underscores the relatively low cultural

awareness regarding regional customs and traditions in Indonesia. Consequently, students are more inclined to explore and seek information about foreign cultures, which are often more accessible and diverse. The adverse consequence of this trend is a diminished knowledge of their own culture among students and a weakened sense of nationalism. Therefore, it is imperative to enhance students' culture, especially given the current era of information openness [10]. According to [11], fostering cultural literacy among students necessitates systematic efforts within education. Integrating local culture into the curriculum and teaching materials to instil a deep appreciation for the nation's rich heritage.

Science encompasses exploring natural phenomena within people's daily lives [12]. This science concept intricately intertwines with society's social fabric [13]. Science education enables students to engage directly with and apply scientific principles that relate to their everyday experiences [14]. As emphasised by [15], the foundation of scientific understanding stems from and extends to routine activities, encouraging students to think scientifically about their immediate surroundings [16]. Educators can enrich the development of science education by tapping into a specific region's distinctive attributes, potential, local culture, and traditions [17]. According to [18], local wisdom represents the hallmark of an area, evolving organically within its environment from one generation to the next. It constitutes original knowledge, often referred to as Indigenous science, rooted in the noble values of cultural traditions [19–22]. Hence, science education must incorporate concepts grounded in local wisdom to safeguard against the erosion of cultural and traditional characteristics unique to each region [23, 24].

The distinctive local culture and traditions that characterise a particular region [18] harbour a wealth of Indigenous knowledge rooted in the honourable values of tradition, which can be subject to scientific study within the realm of science education [12], otherwise known as ethnoscience [25]. Opinion [26] the integration of Indigenous science into science education serves several crucial purposes, including fostering meaningful learning experiences [22, 27], learning by doing [28], accommodating the distinctiveness of each region, and preventing the erosion of local cultural and traditional identity [23]. The opinion [29] confirms this by underscoring that enhancing students' comprehension of Indigenous sci-

ence, embedded within the cultural and traditional heritage passed down from their predecessors, can further the advancement of civilisation. Opinion [30] emphasises that learning constitutes a practical, structured approach to introducing Indigenous science derived from culture and tradition through educational activities. Incorporating Indigenous science into science education can positively impact shaping and assimilating student behaviour to preserve cultural traditions [31], confirmed by [32] highlighting the positive correlation between education and socio-culture. This connection must be acknowledged and integrated into the learning process for the betterment of the nation's youth. Educators in Indonesia can effectively leverage the country's rich socio-cultural diversity to enhance students' learning experiences in science [33, 34].

Learning science concepts rooted in the indigenous knowledge of local culture is called ethnoscience-based learning [25]. Opinion [26] ethnoscience-based learning represents an innovative educational approach that establishes a link between local culture and the acquisition of scientific knowledge [35]. According to [5], ethnoscience-based learning incorporates local wisdom that closely aligns with students' daily experiences to convey scientific concepts effectively. This approach to learning science possesses distinct characteristics, including the presentation of cultural topics related to science, the transformation of existing Indigenous knowledge within society into a scientifically structured framework, the development and deepening of conceptual understanding, and the utilisation of knowledge and skills through exploration activities employing a scientific methodology [36]. The opinion [24] in ethnoscience-based learning is that educators must establish connections between local culture or the indigenous wisdom prevailing in society and scientific knowledge. According to [37], ethnoscience-based learning delivers scientific content by establishing links between cultural traditions within the community and scientific knowledge. Integrating science concepts with culture and community traditions is anticipated to enhance students' acceptance and retention of the material [38].

According to [26], ethnoscience-based learning is "a system of knowledge and cognition specific to a particular culture"; this is supported by the opinion of [39], who emphasises that a crucial aspect of studying science is establishing the

connection between science, technology, and society. Ethnoscience-based learning holds significance in enabling students to cultivate an appreciation for their culture and local wisdom, as underscored [21, 37]. Additionally, it plays a pivotal role in fostering tolerance towards the cultural diversity and local traditions prevalent in various regions, as articulated [11, 40, 41]. Another opinion submitted by [21] is that ethnoscience-based learning serves as a defence against the acculturation of foreign cultures, which is prevalent due to the extensive influence of contemporary electronic media [24]. Consequently, it contributes to constructing an interdisciplinary understanding [39] and imparts a character of cultural preservation to students; this, in turn, helps prevent their detachment from their immediate environment [42].

As reported in research findings [24], implementing ethnoscience-based learning has been observed to ignite students' curiosity and stimulate their active engagement in searching for information related to their study materials. This approach to education can also kindle a sense of pride in one's local culture and enhance students' comprehension of their region's potential [43]. Ethnoscience-based learning, characterised by its contextual nature, assists students in discovering information, honing critical and analytical thinking skills, and equipping them with problem-solving abilities when faced with challenges [44]. As suggested by [45], incorporating discussions of local culture into learning materials is imperative. This inclusion encourages contemplation and reflection on local cultures, facilitating a more effective knowledge transfer.

Ethnoscience-based learning aligns with the primary objectives of science education as outlined by the United Nations Educational, Scientific and Cultural Organization (UNESCO), which aims to cultivate a generation proficient in science and culture [46]. It also promotes attitudes that centre on conserving and safeguarding the unique cultural traditions of local communities [11, 23]. Ethnoscience-based learning serves a dual purpose by enhancing scientific and artistic literacy among students [47, 48]. This dual literacy is crucial for biology education students preparing to become future science educators. Given the rapid advancements in science and technology, there is a growing emphasis on aligning scientific knowledge with everyday life [29]. Consequently, prospective science teachers must have the skills to design and implement ethnoscience-based

learning [26, 42]. This perspective is reinforced by [49], who asserts that applying ethnoscience-based learning is pivotal in shaping students' understanding, perceptions, and attitudes [50, 51].

Science teacher candidates, who will play a vital role as facilitators in education, must possess the expertise to harness Indigenous science embedded in local culture as a valuable resource for science education. Authors [52] elucidate that educators can use instructional methods that leverage Indigenous science to enhance students' grasp of scientific concepts. When the curriculum integrates local culture as a focal point of science education, it can heighten students' motivation and enthusiasm for studying science [26]. Consequently, science teacher candidates must acquire the knowledge and skills to develop and implement ethnoscience-based learning strategies. This preparation equips them to facilitate learning that bolsters students' cognitive abilities and nurtures a commitment to preserving local cultural heritage. Therefore, researching to assess students' knowledge of ethnoscience-based learning is valuable in this context.

METHOD

The study employed an ex post facto research design with a descriptive exploratory approach [53, 54] to elucidate students' perceptions regarding ethnoscience-based learning. The researchers chose this methodology because they examined and measured student attitudes without manipulation or intervention [55, 56]. The study participants included 54 prospective science teacher students, including 28 from Mandalika Education University, 16 from Hamzanwadi University, and 10 from Mataram State Islamic University. The selection of respondents was facilitated through a convenience sampling technique, considering factors such as accessibility and students' willingness to participate in the study by completing an online questionnaire [57].

This investigation used a research tool in the form of a closed questionnaire featuring responses aligned with the Likert scale [58, 59]. These questionnaires were available online, specifically as a Google Form [60]. The questionnaire for assessing student perceptions was developed to gauge their declarative knowledge regarding ethnoscience-based learning. It encompasses nine statements, has undergone rigorous expert validation, and has been declared valid.

The research data underwent an analysis involving quantitative descriptive and inferential statistics. Quantitative descriptive analysis was employed to provide an overview of the data about students' perceptions of ethnoscience-based learning. The average student perception data was interpreted into distinct categories, utilising predefined assessment criteria [61] as presented in Table 1.

Table 1 – Conversion criteria for the average student perception score

Average score (\bar{p})	Category
3.51 – 4.00	Excellent
2.51 – 3.50	Good
1.51 – 2.50	Fair
1.00 – 1.50	Less

The inferential statistical analysis involved utilising the ANOVA test (Analysis of Variance) at a 5% significance level. This test was employed to discern disparities in students' knowledge concerning ethnoscience-based learning among Mandalika University of Education, Hamzanwadi University, and Mataram State Islamic University. A statistical hypothesis was formulated as follows: $H_0: \mu_1 = \mu_2$ (no significant difference in knowledge of students at the Mandalika University of Education, Hamzanwadi University, and Mataram State Islamic University regarding ethnoscience-based learning) and $H_1: \mu_1 \neq \mu_2$ (there is a significant difference in the knowledge of students of Mandalika Education University, Hamzanwadi University, and Mataram State Islamic University regarding ethnoscience-based learning). The decision-making process hinged on comparing *p-values* from the ANOVA test with a predetermined alpha significance level of 0.05. If the *p-value* were smaller than 0.05, H_0 would be rejected, and H_1 would be accepted, or vice versa.

RESULTS AND DISCUSSIONS

Table 2 below describes the data on measuring student perceptions of knowledge about ethnoscience-based learning.

Based on Table 2, it is known that students at the Mandalika University of Education have an average score of student knowledge about ethnoscience-based learning of 2.29 in the Fair category, Hamzanwadi University students 1.84 in the Fair

category, Mataram State Islamic students 2.25 with the Fair category.

Table 2 – Results of student perception data analysis

Group	N	Σ Score	\bar{p}	Category
Mandalika Education University	28	64,17	2,29	Fair
Hamzanwadi University	16	29.50	1.84	Fair
Mataram State Islamic University	10	22.50	2.25	Fair

Data on differences in students' perceptions of knowledge about ethnoscience-based learning were analysed using parametric statistics after fulfilling the prerequisite tests, namely the homogeneity and normality tests, as presented in Table 3 below.

Table 3 – Homogeneity and normality test results

N	Homogeneity		Normality	
	Levenes Statistical test score	Sig.	Kolmogorov-Smirnov's test score	Sig.
56	1,201	0.309	0.759	0.553

The results of the homogeneity test in Table 3 show that the significance value is $0.309 > 0.05$, which means that the data variant is homogeneous. While the results of the normality test show that the significance value is $0.553 > 0.05$, which means that the data is usually distributed.

Analysis of differences in knowledge of students at the Mandalika University of Education, Hamzanwadi University, and Mataram State Islamic University about ethnoscience-based learning was carried out using the ANOVA test (Analysis of Variance) at a significance level of 5% (0.05) with the results of the analysis presented in Table 4 below.

The results of the ANOVA test in Table 4 show that the F value is 5.518 with a significance value of $0.007 > 0.05$, so H_0 is rejected, and H_1 is accepted; this means that there is a significant difference in the knowledge of students at the Mandalika University of Education, Hamzanwadi Uni-

versity, and the Mataram State Islamic University about ethnosience-based learning.

Table 4 – ANOVA test results

	Sum of Squares	df	Mean-Square	F	Sig.
Between Groups	2,163	2	1,082	5,518	0.007
Within Groups	9,998	51	0.196		
Total	12.161	53			

The results of this study elucidate that prospective science teacher students possess a relatively strong understanding of ethnosience-based learning, indicative of their positive perception of this field. These findings underscore the favourable knowledge and attitudes these students hold towards ethnosience; this is the opinion [62] that students' perceptions about science play a pivotal role in bridging their attitudes towards science and scientific knowledge. Opinion [63] explained that knowledge can influence science self-efficacy, fostering positive attitudes. According to [28], students' attitudes towards science are shaped by a comprehensive learning process encompassing cognitive, affective, and psychomotor domains. Consequently, the positive perceptions exhibited by student science teacher candidates towards ethnosience-based learning affirm that they possess a foundational understanding of ethnosience.

The outcomes of this research validate the positive outlook of prospective science teacher students regarding the feasibility of incorporating ethnosience into science education; this suggests that these students recognise the significance of integrating Indigenous scientific knowledge into the science learning process; this is the opinion of [17], which underscores the potential for science education to draw up the region's distinctive strengths and cultural resources. Implementing learning that embraces local cultural traditions and values can foster students' affection for their locale and nation [64]. Furthermore, [65] emphasised that ethnosience-based learning, achieved through integrating local culture and educational materials, can enhance student learning experiences, promoting the development of knowledge, mindset, attitudes, and skills. Therefore, there is a growing need for innovative educational devel-

opment that amalgamates local cultural values with science in learning models, media and modules [64]. Research results [27] have demonstrated that employing an ethnosience approach improves student learning outcomes. Students exhibit higher interest, enthusiasm, and satisfaction with ethnosience-based learning than conventional methods.

The findings from the subsequent study reveal notable disparities in the knowledge of biology education students across Mandalika University of Education, Hamzanwadi University, and Mataram State Islamic University. Furthermore, the average data concerning student perceptions of ethnosience-based learning indicates room for improvement. This study underscores that biology education students at each tertiary institution do not possess uniform knowledge regarding ethnosience-based learning. This situation is likely due to the insufficient exposure of student science teacher candidates to information about ethnosience and the infrequent incorporation of ethnosience-based learning within the classroom. The opinion of [64] supports this: students' limited knowledge about ethnosience is attributed to the lack of awareness about the importance of integrating ethnosience into science education and the absence of educational demands for such integration. However, it is worth noting that incorporating ethnosience into science education is feasible, given the abundance of biological materials that naturally incorporate indigenous science elements rooted in local culture and traditions. Some biology materials contain ethnosience content, namely natural resources and ecosystems [66, 67]. The research outcomes also underscore the scarcity of information available to students through activities like seminars, public lectures, and similar events. This lack of accessible information contributes to the gaps in students' knowledge concerning ethnosience-based learning; this is the opinion of [68], which emphasises that students' understanding of ethnosience can be cultivated through science education that effectively integrates Indigenous science derived from local culture and wisdom.

CONCLUSIONS

Based on the results of the research above, it concludes that:

1) students of the Mandalika University of Education have an average score of student knowledge

about ethnoscience-based learning of 2.29 in the Fair category, Hamzanwadi University students 1.84 in the Fair category, Islamic students Mataram State 2.25 in the Fair category;

2) there is a significant difference in the knowledge of students at the Mandalika Univer-

sity of Education, Hamzanwadi University, and Mataram State Islamic University about ethnoscience-based learning, as evidenced by the results of the ANOVA test with a significance value of $0.007 > 0.05$.

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