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The Effectiveness of Ethnoscience Learning: Perception of Science Teacher Candidates

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Abstract: This study aims to explore the science teacher candidates regarding the effectiveness of ethnoscience learning. This study is an exploratory research conducted at the Mandalika University of Education with research subjects of 28 biology education students. This research uses a research instrument in the form of a closed questionnaire with answers using a Likert scale and has been validated by experts. This research data was analyzed using quantitative descriptive statistics and inferential statistics with independent sample t-test. The study results show that (1) The perception of prospective science teacher students regarding the effectiveness of ethnoscience learning has an average score of 2.98 in the Tall category, while based on gender, the average score for male students is 3.13 with the Tall category and for women it is 2.91 with Tall category; (2) there is no significant difference in the perceptions of male and female students regarding the effectiveness of ethnoscience learning as evidenced by a significance value of 0.116 which is greater than 0.05 (>0.05).

Keywords: Ethnoscience learning; Perception; Science teacher candidates.

Introduction

Education is an important part of life (Khotimah, Reffiane & Handayani, 2022). Education is a process systematic way to develop individual potential in aspects of knowledge, skills and attitudes (Abdullahi, 2014; Ozturk, 2001). According to Nikolopoulou, Abraham & Mirbagheri (2010), education can develop individual potential holistically both cognitively, emotionally, socially and spiritually. Learning in the world of education can prepare students to have multidimensional competencies to face challenges in everyday life (Breton, 2012; Ozturk, 2001). Learning is a process where students gain knowledge, skills and understanding through learning experiences (Johnson, Johnson & Smith, 2014). The learning process involves interaction between lecturers, students, and the learning environment which creates opportunities for students to explore information, apply concepts, and develop new understanding (Hmelo-Silver, 2004). The learning process is expected to create an active and enjoyable learning atmosphere so that students can develop their potential (Rahmayani, 2019).

Effective learning is the hope for all educators and students (Sartika, Efendi & Wulandari, 2021). Effective learning is a process in which students succeed in acquiring knowledge, skills and in-depth understanding of a topic in an efficient and sustainable way (Ambrose et al., 2010). According to Hattie & Timperley (2007), effective learning can facilitate efficient learning processes and have a positive impact on students' understanding and retention of information. An effective learning process can facilitate students to participate in a series of active and enjoyable learning activities in order to achieve the learning objectives that have been set (Slameto, 2018; Leithwood, Sun & Pollock, 2017). This was confirmed by Prince (2004) that effective learning does not only include understanding the

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material, but also involves the use of learning strategies that suit students' learning styles and enable them to develop thinking and collaboration skills. There are various factors that influence learning effectiveness, including the use of active learning strategies and goal-oriented, facilitating discussion and collaboration between students, and creating enjoyable learning activities (Hattie & Timperley, 2007; Slavin, 2009). Thus, every learning process must be designed to be effective and enjoyable, including science learning for students so that it is relevant to everyday life (Sartika, Efendi & Wulandari, 2021).

Science learning is a process where students gain knowledge, skills, and understanding about natural science and how it works (Osborne, 2010). Science learning focuses on understanding basic scientific principles, including scientific theories, concepts and processes (Pella & Kulo, 2005). Science is a science that studies natural phenomena in people's lives (Khoiri & Sunarno, 2018), so that the science learning process must developed contextually according to the surrounding life (Duit, 2009; Aikenhead & Jegede, 1999). Science learning can facilitate direct experience in exploring and applying concepts related to everyday life (Puspasari et al., 2019; Setyowati et al., 2013). This was emphasized by Seroto (2012) that the concept of science originates from and refers to daily activities, thus enabling students to think scientifically about the surrounding environment (Listyawati, 2012). Thus, science learning can be developed by relying on the uniqueness and potential of a region such as local culture and traditions (Kartono, Hairida & Bujang 2010).

Local wisdom is a characteristic of an area that develops in the local environment from generation to generation (Toharudin, et al., 2017). Mardianti, Kasmantoni & Walid (2020) explain that local wisdom is original knowledge (indigenous science) which comes from the noble values of tradition and culture (Rahayu et al., 2021; Ardianti, et. al., 2019; Sudarmin et al., 2019; Setiawan, Innatesari & Sabtiawan, 2017). Science learning that integrates indigenous science known as ethnoscience learning (Sudarmin et al., 2019). Ethnoscience learning is one effective approach because the science learning process does not only understand abstract concepts, but can provide deeper relevance and meaning for students (Wiryanto, Agustin & Husodo, 2019; Supriyadi, Suryadi & Sutarto, 2018). According to Sutiarso, Lestari & Prasetyo (2018), ethnoscience learning can facilitate students to increase their understanding of science in the context of their daily lives. Ethnoscience learning is expected to be an effort to preserve local traditions and culture from generation to generation (Toharudin, et al., 2017). This was emphasized by Kasa (2011) that ethnoscience learning can be a structured and systematic effort to prevent the loss of unique local traditions and culture in an area.

Ethnoscience learning is an approach that can strengthen the relationship between scientific knowledge with indigenous knowledge of the community (Barton et al., 2018; Mahmud, 2011), as well as increasing understanding and respect for cultural diversity and knowledge (Weinstein & Schwartz, 2012). According to Aikenhead (2001), ethnoscience learning has been proven to be an effective approach in increasing understanding of science as well as promoting inclusivity and cultural diversity in science education (Turner, et al., 2014). Ethnoscience learning can be an effective learning approach in developing deeper and contextual understanding of learning material, and can increase student involvement in the learning process (Smith & Johnson, 2017). Ethnoscience learning can facilitate students to have a holistic and in-depth understanding of natural or environmental phenomena through cultural and traditional perspectives held by the community (Maiga & Bowe, 2012). Thus, an effective ethnoscience learning process can develop students' deeper understanding of science and foster an attitude of caring about local culture (Barton et al., 2018; Lim & Loh, 2015).

Ethnoscience learning is important to apply because it allows students to understand the relationship between science and culture in diverse societal contexts (Smith & Johnson, 2018). This is supported by the research results of Muliadi et al (2023) that biology education students at Mandalika University of Education have a positive attitude towards indigenous science-based science learning. This indicates that prospective science teacher students have views about the importance of ethnoscience learning. According to Muliadi, Mirawati & Jannah (2021), to determine the effectiveness of implementing ethnoscience learning, an evaluation is needed to determine the level of achievement of learning objectives. The effectiveness of ethnoscience learning is not only measured by the achievement of learning outcomes, but also in terms of the process (Nugroho, 2012). Student responses or perceptions are a very important indicator to determine the effectiveness of a learning process (Muliadi, Mirawati & Prayogi, 2021). Perception is the process of interpreting stimuli received by students through the five senses to be processed into an understanding (Zhafira, Ertika, & Chairiyaton, 2020). Thus, there is a need for a study to determine the perceptions of prospective science teacher students regarding the effectiveness of ethnoscience learning.

Method

This study is ex post facto research with an exploratory descriptive approach (Cohen, Manion & Morrison, 2007; Muliadi et al, 2022), to describe the knowledge of prospective science teacher students

about the effectiveness of ethnoscience learning. Ex post facto research used because researchers only examine and measure existing student knowledge data without carrying out manipulation or treatment (Cooper & Schindler 2001; Fraenkel, Wallen & Hyun, 2012). The respondents of this research were 28 biology education students at the Mandalika Education University who were obtained through convenience sampling techniques taking into account accessibility and students' willingness to fill out questionnaires distributed online (Fink, 2011; Creeswell, 2012).

This research uses an instrument in the form of a closed questionnaire with answers according to a Likert scale (Muliadi, et al., 2022) with scale degradation namely Strongly Agree, Agree, Disagree, Don't Agree (Creeswell, 2014; Singarimbun, 2007) which is presented in online media in the form of google forms (Adha et al., 2020). Questionnaires were developed to obtain measurements Students' perceptions of the effectiveness of science learning with reference to indicators include quality learning, learning appropriate to ability level, and motivating learning (Slavin, 2009). The questionnaire has been prepared in 6 statements and has been validated by experts and declared valid.

Research data was analyzed using quantitative descriptive statistics and inferential statistics. Quantitative descriptive analysis was used to describe student perception data regarding the effectiveness of science learning. Average student perception data is interpreted in the form of categories using assessment criteria developed by Nugroho et al (2023) as presented in Table 1.

Table 1. Criteria for conversion of average student perception scores

Average score ($\bar{p}$)	Category
3.25 < X ≤ 4.00	Very High
2.50 < X ≤ 3.25	Tall
1.75 < X ≤ 2.50	Low
1.00 < X ≤ 1.75	Very Low

Inferential statistical analysis was used independent sample t-test at a significance level of 5% to determine differences in student perceptions regarding the effectiveness of ethnoscience learning based on gender with the formulation of a statistical hypothesis, namely H_0: μ1 = μ2 (there is no significant difference in the perceptions of male and female students regarding effectiveness ethnoscience learning) and H_1 : μ1 ≠ μ2 (there is a significant difference in the perceptions of male and female students regarding the effectiveness of ethnoscience learning). If the analysis results are significant or p-value t-test is smaller than 0.05, then H_0 is rejected and H_1 is accepted or vice versa.

Result and Discussion

Description of the data from measuring student perceptions regarding the effectiveness of ethnoscience learning is presented in Table 2.

Table 2. Results of student perception data analysis

Variable Group	N	ΣScore	Variance	Standard Deviation	Mean	Cat.
Student	28	83.48	0.118	0.342	2.98	Tall
Male	9	28.17	0.033	0.181	3.13	Tall
Female	19	55.31	0.145	0.381	2.91	Tall

Based on the results of data analysis in table 2, it can be explained that the perception of science teacher candidates regarding the effectiveness of ethnoscience learning has an average score of 2.98 in the Tall category, while based on gender the average score of male students is 3.13 in the Tall category. and women by 2.91 in the Tall category. The data description is emphasized in Figure 1 presentation.

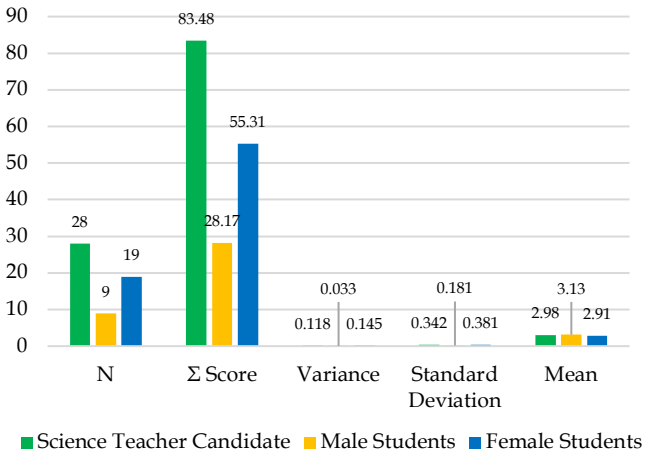

Figure 1. Student perceptions about the effectiveness of ethnoscience learning

Perception data of science teacher candidates regarding the effectiveness of ethnoscience learning were analyzed using parametric statistics, after fulfilling the prerequisite tests, namely the homogeneity test and normality test as presented in Table 3.

Table 3. Homogeneity and normality test results

N	Homogeneity		Normality	
	Levenes Statistical test scores	Sig.	Kolmogorov-Smirnov's test scores	Sig.
35	1.761	0.196	1.020	0.250

The homogeneity test results in Table 3 explain that the significance value of 0.196 is greater than 0.05 (>0.05), which means that the data variance is homogeneous, while the normality test results show a significance

value of 0.250, greater than 0.05 (>0.05) which means the data is normally distributed.

Analysis of differences in perceptions of science teacher candidates regarding the effectiveness of ethnoscience learning based on gender was carried out using the independent sample t-test at a significance level of 5% with the results of the analysis as presented in Table 4.

Table 4. t-test results

Variances	t-test for Equality for Means			
	t	df	Sig.	Mean diff.
Gender	1,626	26	0,116	0,13468

The results of the t test in table 4 explain that the significance value of 0,116 is greater than 0,05 (>0,05), so that H_1 is rejected and H_0 is accepted, which means that there is no significant difference in the perceptions of male and female students regarding effectiveness of ethnoscience learning.

The results of the research explain that (1) science teacher candidates have a good perception of the effectiveness of ethnoscience learning; (2) there is no difference in the perceptions of science teacher candidates regarding the effectiveness of ethnoscience learning based on gender. The findings of this research confirm that science teacher candidates, both male and female, have positive perceptions about the effectiveness of ethnoscience learning. This is possible because students already have fairly good knowledge about ethnoscience and its application in science learning (Muliadi et al., 2023). The research results of Freeman et al (2014) show that students who have a better understanding of ethnoscience tend to have positive opinions about the effectiveness of integrating ethnoscience in science learning. This was confirmed by Astalini et al (2019) that students' positive perceptions about the effectiveness of ethnoscience learning confirmed their attitude in supporting the integration of traditional and local cultural values in science learning. Thus, science teacher candidates have quite good self-efficacy regarding the effectiveness of ethnoscience learning (Hacieminoglu, 2016). This is because the ethnoscience learning process presents local traditional and cultural values (Puspasari et al., 2019), so that it can build an active and enjoyable learning environment (Revelation, 2017), as well as realizing meaningful learning for students (Akmal et al., 2020; Sudarmin, et al., 2017).

The positive response of science teacher candidates can be an indicator of a positive assessment of the effectiveness of ethnoscience learning (Purnamasari & Nurawaliyah, 2021). Lee & Kim (2018) explained that students' perceptions will bridge their attitudes and knowledge towards ethnoscience learning. The findings in this research confirm the positive assessment of science teacher candidates regarding the effectiveness of implementing indigenous science-based science learning in local traditions and culture (Hacieminoglu, 2016; Julianto, Wasis & Agustini, 2018). This means that ethnoscience learning is considered effective in facilitating an efficient science learning process and has a positive impact on students' understanding and retention of information (Hattie & Timperley, 2007). Ethnoscience learning can provide contextual science learning experiences through interactions with concrete objects in everyday life (Ali, 2018; Mardiana, 2018; Rizkianawati, Wiyanto & Masturi, 2014; Koes, 2003). An effective ethnoscience learning process can facilitate students to participate in a series of active and enjoyable learning activities in order to achieve the set learning objectives (Slameto, 2018; Leithwood et al., 2017). Positive perceptions in this research indicate that students have quite good interest and motivation in participating in the ethnoscience learning process (Allen, 2013). This fun learning activity is an indicator of the effectiveness of implementing ethnoscience learning (Hattie & Timperley, 2007; Slavin, 2009).

Ethnoscience learning is effective for exploring students' procedural knowledge about local cultural values (Wahyu (2017; Listyawati, 2012; Chiapetta & Koballa, 2010). Ethnoscience learning is a structured approach to strengthen students' understanding of the relationship between scientific sciences with indigenous science in local traditions and culture (Barton et al., 2018; Mahmud, 2011). The findings of this research confirm previous opinions which state that ethnoscience learning has proven to be an effective approach in increasing understanding of science as well as promoting inclusivity and cultural diversity in science education (Turner et al., 2014; Weinstein & Schwartz, 2012; Aikenhead, 2001). Students assess that the ethnoscience learning process is effective and can facilitate the development of their understanding of science and foster a caring attitude towards local culture (Barton et al., 2018; Lim & Loh, 2015; Maiga & Bowe, 2012). Thus, it is important to apply ethnoscience learning in science learning in higher education to facilitate prospective science teacher students in developing an attitude of love for the traditions and local culture of their region as well as an attitude of tolerance for the cultural diversity of each region in Indonesia (Akmal et al, 2020; Wahyu, 2017; Parris & Linder-VanBerschot, 2010).

Conclusion

Based on the research results above , it can be concluded that (1) prospective science teacher students' perceptions of the effectiveness of ethnoscience learning had an average score of 2.98 in the Tall category, while based on gender, the average score for male students

was 3,13 in the Tall category and women's was 2,91 in the Tall category; (2) there is no significant difference in the perceptions of male and female students regarding the effectiveness of ethnoscience learning as evidenced by a significance value of 0,116 which is greater than 0,05 (>0,05).

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Author Contributions
Desi Ratnasari: developing literature study topics and defining literature analysis methodology.
M. Khairul Wazni, Suhirman, M. Yamin: browsing and mapping literature related to the topic of literature study.
Agus Muliadi: analyzing literature related to literature study topics, writing draft articles, revising, and editing final articles.

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Conflicts of Interest
The authors declare no conflict of interest.

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