Prisma Sains: Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram
https://e-journal.undikma.ac.id/index.php/prismasains/index
e-mail: prismasains.pkpsm@gmail.com

April 2023. Vol. 11, No. 2
p-ISSN: 2338-4530
e-ISSN: 2540-7899
pp. 642-652

Profile of Attitudes of Science Teacher Candidates Towards Indigenous Science-Based Science Learning

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Received: March 2022; Revised: March 2023; Published: April 2023

Abstract

The study aims to explore the attitudes of science teacher candidates towards indigenous science-based science learning. This study is an exploratory research conducted in three study programs that provide science teacher education, namely Biology, Chemistry, and Physics Education with 53 research subjects. This study uses a research instrument in the form of a closed questionnaire with answers using a Likert scale and has been validated by experts. The research data were analyzed using quantitative descriptive statistics and inferential statistics Anova test and t-test. The results of this study are (1) the attitude of students in the biology education study program has an average score of 3,29 in the Good category, physics education is 3,00 in the Good category, and chemistry education is 3,13 in the Good category; (2) the attitude of male students has an average score of 3,21 in the Good category and 3,28 for women in the Good category; (3) there is no significant difference in the attitudes of students of biology, chemistry, physics education study programs towards indigenous science-based science learning in *songket* cloth motifs, as evidenced by the significance value of the Anova test of 0,507>0,05; (4) there is no significant difference in the attitudes of male and female students towards indigenous science-based learning in the *songket* cloths motifs, as evidenced by the significance value of the t-test of 0,455>0,05.

Keywords: attitude, science learning, indigenous science

How to Cite: Muliadi, A., Rokhmat, J., Hakim, A. & Sukarso, AA. (2023). Profile of Attitudes of Science Teacher Candidates Towards Indigenous Science-Based Science Learning. *Prisma Sains : Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram*, 11(2), 642-652. doi: https://doi.org/10.33394/j-ps.v11i2.8199

https://doi.org/10.33394/j-ps.v11i2.8199

INTRODUCTION

Natural Science (IPA) is a science that studies natural phenomena in people's lives (Khoiri & Sunarno, 2018). The concept of science has a relationship with the social life of society (Setyowati et al., 2013), so that through learning science, direct experience can be obtained in exploring and applying concepts related to everyday life (Puspasari et al., 2019). Seroto (2012) emphasized that the concept of natural science originates from and refers to daily activities, thus enabling students to think scientifically about the surrounding environment (Listyawati, 2012). Science learning can be developed by relying on the uniqueness and potential of an area such as local culture and traditions (Kartono et al., 2010). Local wisdom is a characteristic of an area that develops in a local environment from generation to generation (Toharudin, et al., 2017). Mardianti, Kasmantoni & Walid (2020) explain that local wisdom is indigenous knowledge that comes from the noble values of cultural traditions (Rahayu et. al., 2021; Ardianti et. al., 2019; Sudarmin et. al., 2019; Setiawan et.al., 2017). Science learning is important to contain local wisdom-based concepts in order to prevent the loss of cultural and traditional characteristics in an area (Kasa, 2011).

Science learning is a process of discovery and formation of scientific attitudes (Mardiana, 2018). According to Suastra (2009) that learning science is an ideal way to acquire competency skills, maintain attitudes, and develop mastery of concepts related to everyday life. Science education is expected to be a vehicle for students to learn about the natural surroundings and prospects for further development in everyday life (Ali, 2018). Rizkianawati, Wiyanto & Masturi (2014) explained that the science learning process prioritizes giving direct experience to develop competencies in order to explore and understand the natural surroundings scientifically. Thus, science learning is directed to inquiry and project-based (Zulfa et al., 2022; Samsudin et al., 2020; Afriana, Permanasari & Fitriani 2016) to build students' direct experience about nature (Kubicek, 2005), creativity and thinking skills (Ummah, In'am & Azmi, 2019). Indriani (2013) explains that science learning can also be developed with scientific inquiry to foster creative thinking and literacy skills (Suryadari et al., 2018) as important aspects of life skills (Rizkianawati, Wiyanto & Masturi, 2014).

Science learning is expected to be able to explore the dimensions of science as a product, science as a process, and science as an attitude (Ali, 2018), as well as dimensions of procedure and science as technology as a result of the development of these three components (Chain & Evan, 1990). To realize the multidimensional science learning, active involvement of students is required to interact with concrete objects in everyday life (Ali, 2018; Mardiana, 2018; Rizkianawati, Wiyanto & Masturi, 2014; Koes, 2003). This is confirmed by Khoiri & Sunarno (2018) that science learning must be contextual so that it can present natural phenomena in people's lives in every science concept learning activity (Setyowati et al., 2013). Science learning can facilitate students to gain direct experience in exploring and applying science concepts related to everyday life (Puspasari et al., 2019). This learning activity certainly allows students to think scientifically about a natural condition and the surrounding environment (Listyawati, 2012; Seroto, 2012). Thus, the development of science learning should rely on the uniqueness and potential of the environment around students in each region such as local culture and traditions (Kartono et al., 2010).

Local culture and traditions that characterize an area (Toharudin et al., 2017) contain *indigenous science* that comes from the noble values of tradition and can be studied scientifically in science learning (Khoiri & Sunarno, 2018) or known as ethnoscience (Wati et al., 2020; Sudarmin, Sumarni & Mursiti, 2018). Integrating *indigenous science* in science learning in order to present meaningfull learning (Atmojo, Lukitoaji & Muhtarom, 2021; Sudarmin, et al., 2019), learning by doing (Alvonco 2014), accommodating regional uniqueness, as well as preventing the loss of the uniqueness of local culture and traditions (Kasa, 2011). This is confirmed by the opinion of Sarini & Selamet (2019) that civilization development can be carried out by strengthening students' understanding of indigenous science contained in culture and traditions inherited from their predecessors. Hadi & Ahied (2017) emphasized that learning is an effective, structured effort to introduce indigenous science in culture and tradition through learning activities. Indigenous science integration in science learning can have a positive impact on cultivating and acculturating student behavior to preserve culture (Suastra, 2011). This was emphasized by Trianto (2014) that education and socio-culture have a positive correspondence that must be realized in learning for the nation's generation. Thus, socio-cultural diversity in Indonesia can be optimized to support students' learning experiences in learning science at school (Irawan & Muhartati, 2019; Hadi et al., 2019).

Education is a deliberate and structured activity (Purwanto, 2011) to empower the potential of each generation to be able to develop and build civilization in the future (Hadi & Ahied, 2017; Hadi et al., 2019). Civilization development can be carried out by strengthening the understanding of the nation's children towards the heritage of their predecessors in the surrounding environment such as culture and customs (Sarini & Selamet, 2019). Hadi & Ahied (2017) emphasized that education is an effective, structured effort to introduce culture

through learning activities. According to Suastra (2011) that education has a formal role in cultivating and acculturating student behavior in preserving culture. Education and socio-culture have a positive correspondence that must be realized in learning for the nation's generation (Trianto, 2014). Social culture can make a certain contribution to student learning experiences both in cognitive, affective, and psychomotor aspects (Irawan & Muhartati, 2019). Hadi et al. (2019) state that socio-cultural diversity in Indonesia can be optimized to support student learning at school.

The diversity and uniqueness of traditions and culture in Indonesia (Sarini & Selamet, 2019), contains various indigenous sciences (Battiste, 2005). According to Arlinovita, Setiawan & Sudibyo (2015), daily social activities cannot be separated from the culture that developed and was passed down by previous generations (Sibarani & Kurniawan, 2017; Arlinovita, Setiawan & Sudibyo, 2015). One of the popular cultures of the people of Lombok is the activity of weaving traditional cloth typical of the *Sasak* tribe which is called *nyensek* in the local language. Based on the results of observations in Batujai village as a center for songket production, information was obtained that women of the *Sasak* tribe engaged in *nyensek* activities which produced a product called *songket* cloth (woven cloth) with motifs typical of the *Sasak* tribe. The resulting *songket* motifs vary and each has a strong philosophical meaning in the life of the Sasak people (Sumadewa & Hasbullah, 2021). This is confirmed by Jayadi's opinion (2016) that the songket motif *is* a form of cultural expression of the *Sasak* people which is inherited from each generation. The meaning of each *songket* motif is to provide public understanding of symbols of local wisdom that have become entrenched in the *Sasak* tribe (Hasbullah, Santosa & Swandi, 2020).

popular *songket* motifs typical of the Lombok Sasak tribe are *wayang, subahnale, keker atau merak, bintang empat, dan lumbung/alang* motifs. The results of Misnawati's research (2016) explain that (1) *wayang* motifs are reconstructed from images of the wedding couple and cape flower petals, which means that humans must live together and respect each other; (2) *subahnale* motif is reconstructed from images of cape flower petals and ylang flower crowns, which mean that God is Almighty because it is based on the word *Subhanallah*; (3) *keker* motif and *merak* is reconstructed from the image of a peacock and a tree branch, which means that holy love is eternal; (4) the *bintang empat* motif is reconstructed from the image of a four-star (morning star) and a fried flower crown, which means that there are four cardinal directions in life; (5) the *alang* motif is reconstructed from images of reeds (barns), tanjung flower petals, and ylang flower crowns, which mean prosperity and prosperity. According to Misnawati (2016), *songket* motifs inspired by biodiversity in the surrounding life such as animal species, flower types, and floral structures, contain indigenous science information that is relevant for elaboration in science learning (Toharudin et al., 2017; Parmin et al., 2017; Parmin et al. al., 2017; Wati et al., 2020).

Indigenous science-based science learning which is contained in *songket* cloth motifs can facilitate a system of knowledge and cognition typical of a given culture (Sudarmin, Sumarni & Mursiti, 2018). This is supported by the opinion of Chiapetta & Koballa (2010) that one of the important dimensions in studying natural science is to construct the relationship between science and technology and society. Thus, indigenous science-based science learning is important for students to build an attitude of loving culture and local wisdom through recognizing the cultural potential of an area (Sudarmin et al., 2019; Parris & Linder-VanBerschot, 2010), developing an attitude of tolerance for cultural diversity and local traditions of each region (Hikmawati, Suastra & Pujani, 2020; Akmal et al., 2020; Wahyu, 2017). Another opinion was conveyed by (Sudarmin et al., 2019) that indigenous science-based learning can fortify students from acculturation of foreign cultures which are transformed by today's very massive electronic media (Mardianti, Kasmantoni & Walid, 2020). Thus, indigenous science-based learning can construct an interdisciplinary understanding (Chiapetta & Koballa, 2010; Krajcik et al., 1999), and student attitudes

comprehensively about the surrounding culture and avoiding alienation from their environment (Parmin et al, 2017; Wahyu, 2017; Listyawati, 2012).

Indigenous science-based learning in songket cloth motifs has relevance to the main goals of science education set by the United Nations Educational, Scientific and Cultural Organization (UNESCO), namely to create a young generation who are literate in science and culture (Sudarmin & Asyhar, 2012), an attitude of conservation and prevention the loss of cultural uniqueness and traditions of the *Sasak* people (Kasa, 2011; Hikmawati, Suastra & Pujani, 2020). Utilizing indigenous science in *songket* motifs in the science learning process can strengthen scientific literacy skills as well as cultural literacy for students (Pertiwi & Firdausi, 2019; Arlianovita, Setiawan & Sudibyo, 2015). It is very important for students as science teacher candidates to have ethnoscientific insights because of the rapid pace of science and technology which has given birth to scientific science which must be oriented in everyday life (Sarini & Selamet, 2019). Indigenous science-based learning is important to equip science teacher candidate students (Parmin, 2017; Sudarmin et al., 2018). This learning is one of the important factors for fostering students' understanding, perceptions, and attitudes towards ethnoscience (Dewi, 2016; Antoncic and Hisrich, 2003; Fiet, 2001). Thus, it is necessary to map students' attitudes about science learning based on indigenous science in *songket* motifs typical of the *Sasak* people of Lombok.

METHOD

Study is an ex post facto research with a descriptive exploratory approach (Cohen, Manion & Morrison, 2007; Muliadi, Mirawati & Prayogi, 2021), to describe the attitude profile of biology students towards learning natural science based on indigenous science in *songket* motifs. Ex post facto research was used because researchers only studied and measured existing student attitude data without manipulation or treatment (Cooper & Schindler 2001; Fraenkel, Wallen & Hyun, 2012). Respondents to this study were 53 science teacher candidate students in the biology, physics, and chemistry education study programs at the Mandalika University of Education who were obtained through a convenience sampling technique with considerations of accessibility and student willingness to fill out questionnaires which were distributed online (Fink, 2011; Creeswell, 2012).

This study used an instrument in the form of a closed questionnaire with answers according to a Likert scale (Muliadi et al., 2022) with a degradation of the scale, namely Strongly agree, agree, less agree, disagree (Creeswell, 2014; Singarimbun, 2007) presented in online media in the form of google forms (Adha et al., 2020). The questionnaire was developed referring to indicators of student attitudes about indigenous science-based learning which includes Cognitively Based Attitude, Affectively Based Attitude, and Behaviorally Based Attitude (Aronson, Wilson & Akert, 2007). The questionnaire has been compiled in 14 statements developed by Rikizaputra et al. (2021) and carried out modifications, and has been validated by experts (*experts*) and declared valid.

Research data were analyzed using quantitative descriptive statistics and inferential statistics. Quantitative descriptive analysis is used to describe student attitude data towards indigenous science-based learning in *songket* motifs. The average student attitude data is interpreted in the form of categories using the assessment criteria developed by Muliadi (2020) as presented in Table 1.

Table 1. Conversion criteria for the average student attitude 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 used was (1) Anova test (Analysis of Variance) at a significance level of 5% to determine differences in student attitudes between study programs

with the formulation of statistical hypotheses, namely H_0 : μ1 = μ2 (no significant difference in attitudes of students in education study programs biology, chemistry, physics towards indigenous science-based learning) and H_1 : μ1 ≠ μ2 (there are significant differences in the attitudes of students of biology, chemistry, physics education study programs towards indigenous science-based learning); (2) t-test (independent sample t-test) at a significance level of 5% to analyze differences in students' attitudes based on gender with the formulation of a statistical hypothesis that is H_0 : μ1 = μ2 (no significant differences in the attitudes of male and female students women towards indigenous science-based learning) and H_1 : μ1 ≠ μ2 (there are significant differences in the attitudes of male and female students towards indigenous science-based learning). If the results of the Anova test and t-test produce *a p-value* smaller than the alpha test value of 0.05, then H_0 is rejected and H_1 is accepted or vice versa.

RESULTS AND DISCUSSION

Description of the data on the results of measuring students' attitudes towards indigenous science-based learning in the *Sasak* ethnic *songket* motif is presented in Table 2 below.

Table 2. Results of student attitude data analysis

Variable Group		N	Σ Score	$\bar{p}$	Category
Attitude Component	*Cognitively Based Attitude*	53	169,33	3,19	Good
	Affectively Based Attitude	53	184,50	3.48	Good
	Behaviorally Based Attitude	53	166,75	3,15	Good
Gender	Man	15	48,21	3,21	Good
	Woman	38	124,71	3,28	Good
Study program	Biology Education	33	108,71	3, 29	Good
	Physical education	13	39,00	3.00	Good
	Chemistry Education	7	21,93	3,1 3	Good

Based on Table 2, it is known that (1) students' attitudes towards the cognitive component have an average score of 3,19 in the Good category, the affective component is 3,48 in the Good category, the behavioral component is 3,15 in the Good category; (2) the attitude of male students has an average score of 3,21 in the Good category and 3,28 for women in the Good category; (3) the attitude of students in the biology education study program has an average score of 3,29 in the Good category, physics education is 3,00 in the Good category, and chemistry education is 3,13 in the Good category. The description of the data is emphasized in the following Figure 1.

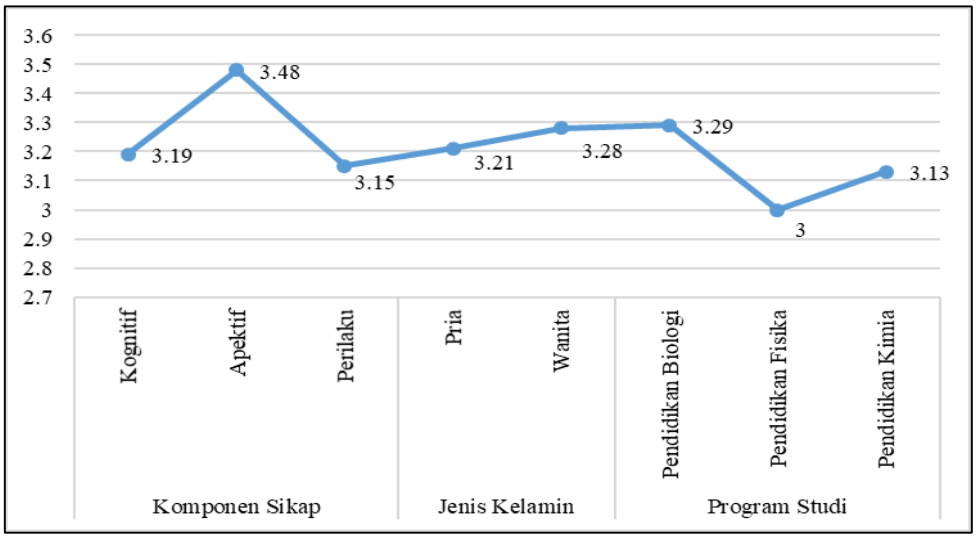

Figure 1. The average score of student attitudes

Profile data of students' attitudes towards indigenous science-based learning in the *Sasak songket* motif based on gender and study program were analyzed using parametric statistics, after fulfilling the prerequisite tests, namely the homogeneity test and normality test 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	1,013	0,370	0,829	0,497

The results of the homogeneity test in table 3 show that the significance value is 0,370>0,05, which means that the data variant is homogeneous. While the results of the normality test show that the significance value is 0,497>0,05, which means that the data is normally distributed.

Analysis of differences in the attitudes of students of biology, chemistry and physics education study programs towards indigenous science-based learning in the *songket* motif 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.

Table 4. Anova test results

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	29,944	2	14,972	0,688	**0,507**
Within Groups	1087,633	50	27,752		
Total	1117,547	52			

The results of the Anova test in table 4 show that the F value is 0,688 with a significance value of 0,507> 0,05, so that H_1 is rejected and H_0 is accepted. This means that there is no significant difference in the attitudes of students of biology, chemistry, physics education study programs towards indigenous science-based science learning in *songket* motifs.

Analysis of differences in the attitudes of male and female students towards indigenous science-based learning in *songket* motifs was carried out using the t-test (independent sample t-test) at a significance level of 5% (0.05) with the results of the analysis presented in Table 5 below.

Table 5. The results of the t-test (independent sample t-test) for the gender group

Group			t-test for Equality for Means			
			t	df	Sig.	Mean diff.
Student Attitude	Equal Variances Assumed	Gender	-0,752	5 1	0,455	-0,07867

The results of the t-test in table 5 show that the significance value is 0,455 >0,05, so that H_1 is rejected and H_0 is accepted. This means that there is no significant difference in the attitudes of male and female students towards indigenous science-based learning in *songket* motifs.

The elaboration of the results of this study explains that prospective science teacher students have a good attitude towards indigenous science-based science learning. These results indicate that students have a positive perception of the development of indigenous science-based science learning in songket motifs, meaning that prospective science teacher students have knowledge of *songket* motifs and indigenous science contained therein, as well as the possibility of their application in learning science concepts. This is in accordance with the opinion of Lee & Kim (2018) that attitudes toward science and scientific knowledge are bridged by perceptions of science. So that based on this flow, cognitive or knowledge aspects can influence acceptance of science, which can then encourage better attitudes towards

science (Purnamasari & Nurawaliyah, 2021). According to Aka (2016) attitudes toward science are formed as a result of a comprehensive learning process, covering cognitive, affective, and psychomotor domains, with life experiences. The positive attitude of prospective science teacher students in this study confirmed their initial knowledge of indigenous science-based science learning in *songket* motifs.

The results of this study explain that prospective science teacher students have a positive attitude towards the development of indigenous science-based science learning in *songket* motifs. Student attitudes toward science can be an indicator of an assessment of the science learning process (Purnamasari & Nurawaliyah, 2021). Thus, the findings in this study confirm that students evaluate positively the development and application of indigenous science-based science learning (Hacieminoglu, 2016; Julianto, Wasis & Agustini, 2018). According to Astalini et al. (2019), a positive attitude shows that prospective science teacher students support the concept of learning science based on indigenous science and show a good interest in pursuing science (Fulmer et al., 2019; McDonald et al., 2019). This is in accordance with the opinion of Sethi (2015) that attitudes towards science are used to show that students feel and think about science. Student attitudes are one of the key factors in learning science (Liaghatdar, Soltani & Abedi, 2011). This is in accordance with the results of research by Purnamasari & Nurawaliyah (2021) that students have a positive attitude towards learning ethnoscience as indicated by a high percentage of attitudes on the dimensions of feelings about science, desire or interest in having a career in science, and attitudes towards inventions and technological advances.

The results of further research explained that there were no significant differences in student attitudes based on study programs and gender. This explains that all prospective science teacher students have a positive attitude towards the development and application of indigenous science-based learning in songket motifs. The findings of this study confirm that students have positive feelings towards ethnoscience-based science learning (Astalini et al., 2019), so that it can influence their abilities in science (Usta & Akkanat, 2015). This means that students expect science learning based on indigenous science contained in *songket* cloth motifs. This learning is important for constructing an interdisciplinary understanding (Chiapetta & Koballa, 2010; Krajcik et al., 1999), and student attitudes comprehensively about the surrounding culture and avoiding alienation from their environment (Parmin et al, 2017; Wahyu, 2017; Listyawati, 2012). The integration of *songket* motifs in science learning is possible because the motifs are inspired and reconstructed from the biodiversity around the *Sasak* people and have relevance to the concept of science. In the opinion of Hadi, et al. (2019), indigenous science contained in the culture of society is important to be explored in the concept of learning science. Science learning should be able to facilitate active student interaction with concrete objects (Koes, 2003) by developing the surrounding environment as a learning resource (Arlianovita, Setiawan & Sudibyo, 2015).

CONCLUSION

Based on the results of the research above, it can be concluded that (1) the attitudes of students in the biology education study program have an average score of 3,29 in the Good category, physics education is 3,00 in the Good category, and chemistry education is 3,13 in the Good category; (2) the attitude of male students has an average score of 3,21 in the Good category and 3,28 for women in the Good category;(3) there is no significant difference in the attitudes of students of biology, chemistry, physics education study programs towards indigenous science-based science learning in *songket* motifs, as evidenced by the significance value of the Anova test of 0,507>0,05; (4) there is no significant difference in the attitudes of male and female students towards indigenous science-based learning in *songket* motifs, as evidenced by the significance value of the t-test of 0,455>0,05.

ACKNOWLEDGMENTS

We would like to thank to all the parties that help to complete the research entitled "Profile of Attitudes of Science Teacher Candidates Towards Indigenous Science-Based Science Learning".

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