



# The Effect of Ethnoscience Learning on the Development of Students' Cognitive and Affective Aspects in Junior High School

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**Abstract:** This research aims to examine the influence of ethnoscience learning on the development of students' cognitive and affective aspects. This quasi-experimental research uses a pre-test post-test non-equivalent control group design. This research was carried out in the odd semester of the 2022/2023 academic year. The population of this study was 320 class VII students at MTsN 1 Mataram, with a sample size of 34 people in the experimental class and 34 people in the control class. Data was obtained from test instruments for the "cognitive" aspect in the form of essays and questionnaire instruments for the "affective" aspect in the form of attitude statements. The statistical test used in this research is one-way MANCOVA with one covariate. The results of the research show that there is a significant difference in the influence of using ethnoscience learning on cognitive and affective learning simultaneously or together after controlling for students' initial abilities. The cognitive and affective scores of students in classes that use ethnoscience learning are higher than those in conventional classes. The conclusion of this research is that ethnoscience learning has a positive effect on the cognitive and affective aspects of junior high school students at MTsN 1 Mataram.

**Keywords:** Affective; Cognitive; Ethnoscience

## Introduction

The competencies that 21st century students must have to face various problems include all aspects of learning outcomes, namely cognitive, affective and psychomotor aspects (Prachagool & Nuangchalerm, 2021). The cognitive aspect consists of remembering, understanding, applying, analyzing, evaluating, creating (Arif et al., 2024). The affective aspect consists of receiving, responding, appreciating, organizing, characterizing according to values (Pujiastuti et al., 2020). Psychomotor aspects consist of imitation, manipulation, precision, articulation, naturalization (Ichsan et al., 2020).

These competencies can be realized through a learning process that is centered on students and an

effective learning process (Dewi et al., 2020). Effective learning requires innovation in the field of education, such as learning that combines science and ethnoscience (Dwianto et al., 2017). Professional teachers should be able to plan, implement and evaluate ethnoscience-based learning (Hakim et al., 2020).

Ethnoscience is knowledge possessed by a certain group of people which can be in the form of knowledge, customs and local culture. Ethnoscience learning is contextual-based learning because it utilizes what students see and observe directly (Ariyatun, 2021). Therefore, ethnoscience learning provides meaningful learning experiences for students and increases their learning motivation (Widiana et al., 2020). Ethnoscience-based learning should consider the concept of

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differentiated learning so that the quality of the learning process and outcomes is better (Azizah et al., 2024).

Research on ethnoscience learning shows an increasing trend from year to year (Rodiyana et al., 2024). Ethnoscience learning has been proven to be able to improve students' various competencies for future preparation (Parmin et al., 2016). Ethnoscience learning has a positive effect on critical thinking skills (Hikmawati et al., 2021), creativity, scientific literacy (Setiawan et al., 2017) and digital literacy (Zulkarnain et al., 2024), environmental literacy (Ilhami et al., 2019), problem solving (Irwandi et al., 2024), concern for the environment (Mithen et al., 2021), concern for local culture (Hikmawati et al., 2020), social ethics (Madrah et al., 2024), and metacognitive awareness (Ilma et al., 2022).

One of the challenges in designing ethnoscience learning is identifying ethnoscience that has scientific correlations so that it can be integrated into subjects (Hikmawati et al., 2021). Another challenge is determining the right learning model so that it can be implemented in the classroom (Hastuti et al., 2020). In addition, the provision of ethnoscience-based teaching materials is a supporting factor in the successful implementation of ethnoscience learning, both offline and online (Mahdian et al., 2024). These teaching materials will be more effective if they are equipped with student worksheets or investigation activities (Mardiyanti, 2024). Investigation activities in groups will support problem solving and collaboration abilities (Wijaya et al., 2024), and can empower metacognitive skills and science process skills (Siswati et al., 2024). Another thing that needs to be taken into consideration is developing an ethnoscience-based assessment instrument so that it can measure learning outcomes in accordance with the learning objectives (Hikmawati et al., 2021).

This research aims to analyze the effects of ethnoscience learning on the development of cognitive and affective aspects of students in junior high schools. Ethnoscience learning in this research uses ethnoscience on Lombok Island, taking the research location at one of the state schools in the city of Mataram.

## Method

This quasi-experimental research at MTsN 1 Mataram used a non-equivalent posttest only control group design. This research was carried out in the odd semester of the 2022/2023 academic year. The research population included 320 MTsN 1 Mataram students in grade VII, with a sample size of 34 people in the experimental class and 34 people in the control class. Data was obtained from test instruments for the

"cognitive" aspect and questionnaires for the "affective" aspect. The test instrument for the "cognitive" aspect includes 10 descriptive questions and the questionnaire instrument for the "affective" aspect includes 12 attitude statements.

The equation used in calculating student scores for cognitive aspects is: the ratio between the total score of students' answers and the maximum score multiplied by 100%. The attitude questionnaire uses 4 answer choices with the following meanings: "SA" means that the statement Strongly Agrees if the statement really matches what one feels; "A" means that the statement Agrees if the statement tends to agree but does not fully agree with what is felt; "NA" means that a statement does Not Agree if the statement tends to disagree but does not completely disagree; "SD" statement Strongly Disagrees if the statement really does not match what is felt.

The statistical test used in this quasi-experimental research at MTsN 1 Mataram was one-way MANCOVA with one covariance. The analysis used was assisted by the SPSS version 25 application. Before carrying out statistical tests, cognitive and affective data passed 3 prerequisites, namely that there was no multicollinearity between dependent variables, multivariate normality of the data, and homogeneity of the variance-covariance matrix.

## Result and Discussion

Ethnoscience learning in the experimental class when carrying out investigative activities compares the results of measuring the basic quantity "Length" using standard and non-standard units. Standard units use centimeters and meters. Non-standard units use *sesata*, *sedepa*, *sprungjung*. These activities can be seen in Figure 1, Figure 2, and Figure 3.



Figure 1. Measuring the length of the table using a ruler, in centimeters



**Figure 2.** Measuring the length of the classroom using a meter, in meters



**Figure 3.** Measuring the length of the classroom using hand, in fathom units

**Table 1.** Descriptive Statistics

Test			Mean	Std. Deviation	N
Cognitive	post test	experimental class	83.97	6.250	34
		control class	74.85	7.016	34
		Total	79.41	8.036	68
	total	experimental class	70.44	16.155	68
		control class	66.03	14.675	68
		Total	68.24	15.534	136
Affective	post test	experimental class	92.59	5.058	34
		control class	88.41	6.382	34
		Total	90.50	6.090	68
	total	experimental class	86.57	8.358	68
		control class	84.25	7.687	68
		Total	85.41	8.084	136

**Table 2.** Linear Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.381 <sup>a</sup>	0.145	0.132	7.485

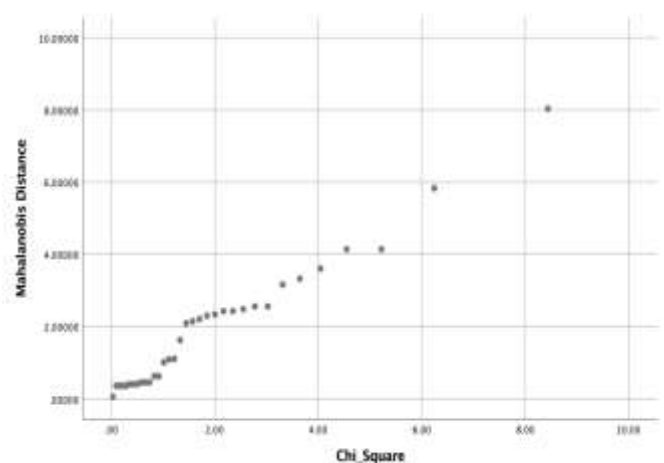
a. Predictors: (Constant), Affective Post Test

The results of descriptive tests for data at MTsN 1 Mataram show that classes that use ethnosience learning have average scores for cognitive aspects and affective aspects of 83.97 and 92.59 respectively. The classes that use conventional learning have average scores for cognitive aspects and affective aspects of 74.85 and 88.41 respectively. Thus, classes that use ethnosience learning are superior to classes that use conventional learning, both for cognitive and affective aspects. The comparison between the experimental class and the control class can be seen in Table 1.

Based on the regression analysis, an R Square value of 0.145 was obtained, this value is less than 0.8 so it can be concluded that the cognitive and affective data do not have multicollinearity. The R Square value can be seen in Table 2.

Figure 4 shows the output of the experimental class multivariate normality test at MTsN 1 Mataram. Mahalanobis distance and chi square for the experimental class tend to follow a straight line. This means that the cognitive and affective data of students

who take part in ethnosience learning have a multivariate normal distribution.



**Figure 4.** Multivariate normality test output for the experimental class

The same thing also happens in the control class, as can be seen in Figure 5. Mahalanobis distance and chi

square for the control class tend to follow a straight line. This means that the cognitive and affective data of students who take part in conventional learning have a multivariate normal distribution.

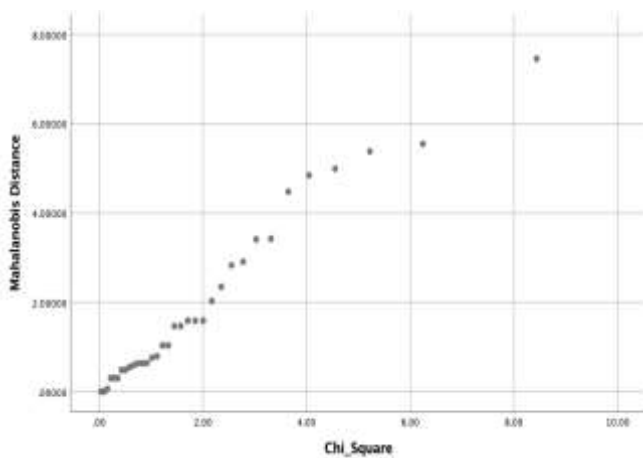


Figure 5. Multivariate normality test output for the control class

MANCOVA requires that the variance covariance matrix of the dependent variable is the same. The homogeneity test of the variance covariance matrix can be seen from the results of the Box's M test. The results of the Box's M test with SPSS are shown in Table 3. It turns out that the Box's M value is 2.509 and the F value is 0.809 with a significance (Sig.) of 0.489. The significance level of this research is 0.05, so the Box's M value obtained is not significant, because the significance obtained at 0.489 is greater than 0.05. Thus, the variance covariance matrix of the dependent variable

is the same for both classes (experimental and control), so that MANOVA analysis can be continued. Table 3 shows the data homogeneity test at MTsN 1 Mataram.

Table 3. Box's Test

Box's Test of Equality of Covariance Matrices <sup>a</sup>	
Box's M	2.509
F	0.809
df1	3
df2	784080.000
Sig.	0.489

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.  
a. Design: Intercept + Class

After all hypothesis testing requirements are met, proceed with MANCOVA hypothesis testing. This experimental research at MTsN 1 Mataram compared the cognitive and affective characteristics of students who took ethnoscience learning with students who used conventional learning. Decisions are taken using Pillai's Trace, Wilks' Lambda, Hotelling's Trace, Roy's Largest Root analysis.

The analysis results show that the F value for Pillai's Trace, Wilks' Lambda, Hotelling's Trace, Roy's Largest Root has the same value, namely 17,170 with a significance value of 0.000 which is much smaller than 0.05. This means that the F values for Pillai's Trace, Wilks' Lambda, Hotelling's Trace, Roy's Largest Root are all significant. It can be said that there are cognitive and affective differences between students who use ethnoscience learning and students who use conventional learning. The results of this analysis can be seen in Table 4.

Table 4. Multivariate Tests<sup>a</sup>

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	0.997	10659.348 <sup>b</sup>	2.000	65.000	0.000
	Wilks' Lambda	0.003	10659.348 <sup>b</sup>	2.000	65.000	0.000
	Hotelling's Trace	327.980	10659.348 <sup>b</sup>	2.000	65.000	0.000
	Roy's Largest Root	327.980	10659.348 <sup>b</sup>	2.000	65.000	0.000
Class	Pillai's Trace	0.346	17.170 <sup>b</sup>	2.000	65.000	0.000
	Wilks' Lambda	0.654	17.170 <sup>b</sup>	2.000	65.000	0.000
	Hotelling's Trace	0.528	17.170 <sup>b</sup>	2.000	65.000	0.000
	Roy's Largest Root	0.528	17.170 <sup>b</sup>	2.000	65.000	0.000

a. Design: Intercept + Class

b. Exact statistic

The results of the different tests for each dependent variable separately show that the cognitive differences between students who use ethnoscience learning and students who use conventional learning produce an F value of 32.017 with a significance of 0.000. This shows that there are differences in cognitive aspects due to the differences in learning used. On the other hand, the

difference in affective aspects between students who use ethnoscience learning and students who use conventional learning produces an F value of 8.943 with a significance of 0.004, which is also significant at a significance level of 0.05. This means that the learning used also results in affective differences. This can be seen in Table 5.

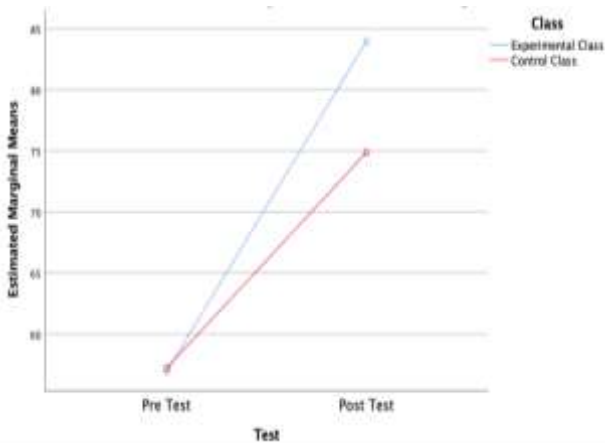
**Table 5.** Tests of Between-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Cognitive	1413.235 <sup>a</sup>	1	1413.235	32.017	0.000
	Affective	296.529 <sup>b</sup>	1	296.529	8.943	0.004
Intercept	Cognitive	428823.529	1	428823.529	9715.093	0.000
	Affective	556937.000	1	556937.000	16796.133	0.000
Class	Cognitive	1413.235	1	1413.235	32.017	0.000
	Affective	296.529	1	296.529	8.943	0.004
Error	Cognitive	2913.235	66	44.140		
	Affective	2188.471	66	33.159		
Total	Cognitive	433150.000	68			
	Affective	559422.000	68			
Corrected Total	Cognitive	4326.471	67			
	Affective	2485.000	67			

a. R Squared = .327 (Adjusted R Squared = .316)

b. R Squared = .119 (Adjusted R Squared = .106)

The graph in Figure 6 shows that there are differences in the results of the treatment given to the experimental class and the control class at MTsN 1 Mataram. Difference indicators can be seen based on the shape of the lines that are not parallel on the resulting graphic plot. The experimental class experienced a higher increase than the control class. Ethnoscience learning has a positive influence on students' cognitive abilities.

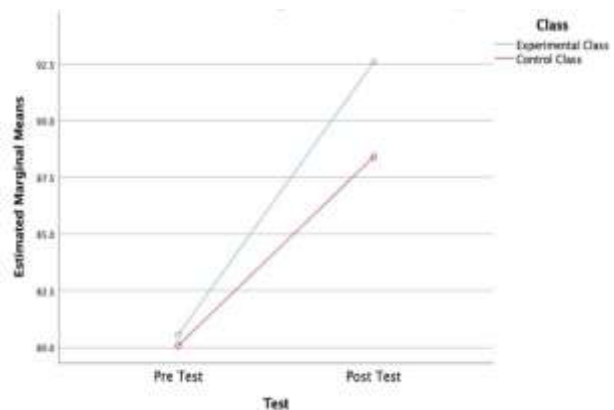


**Figure 6.** Estimated marginal means of cognitive

The same thing also happens with affective as shown in Figure 7. The shape of the lines does not look parallel, meaning there are differences in treatment results so it can be said that ethnoscience has a positive influence on affective.

Problem-based ethnoscience learning in this research has been proven to have a positive impact not only on the cognitive domain, but also on the affective domain (Hikmawati et al., 2021). The ethnoscience-based assessment in this research has succeeded in measuring cognition at the HOTS level, namely analysis, evaluation and creation. In addition, this research has succeeded in measuring affectivity in the indicators of

receiving, responding and appreciating (Hikmawati et al., 2021). Thus, it can be concluded that ethnoscience-based investigation activities in science learning in junior high schools are proven to be able to develop students' cognitive and affective abilities (Amaliyah et al., 2024).



**Figure 7.** Estimated marginal means of affective

Ethnoscience learning needs to be developed and included in curriculum policies. This aims to make students more familiar with their own culture and able to preserve culture which has begun to be eroded by the times (Kurniawati et al., 2017). Ethnoscience learning has the benefit of maintaining national identity so that it has a different identity from other nations. It is hoped that ethnoscience learning can become a bulwark to protect the younger generation from foreign cultures that do not match their character values (Jamaluddin et al., 2022) or values contained in Pancasila (Suprpto et al., 2021).

The treatment in the form of ethnoscience learning in the experimental class showed better results than the control class which used conventional learning. The students' average scores for cognitive aspects and affective aspects in the experimental class were higher

than those in the control class. Ethnoscience learning can be an innovative learning alternative that facilitates student-centered learning and creates effective learning. Similar research also found that contextually based learning, which occurs in students' daily lives, as well as through investigative activities can improve student learning outcomes (Akmar et al., 2024).

Ethnoscience learning can not only be used in science or biology subjects (Ramdiah et al., 2020) and chemistry (Sutrisno et al., 2020), but also in other subjects, namely mathematics. Ethnoscience learning not only improves students' ability to master concepts, but also communication skills (Turmuzi et al., 2024). The integration of ethnoscience in learning is very possible in all subjects, especially in Indonesia which is very rich in tradition and culture (Tohri et al., 2022).

Students become motivated and enthusiastic in learning by connecting the subject matter with what is in the environment where they live (Hadisaputra et al., 2020). Contextual learning that utilizes ethnoscience will provide valuable and meaningful experiences for students because the phenomena studied are in accordance with what happens in everyday life (Yani et al., 2021). Ethnoscience is not only about local traditions or culture, but is also related to religion and beliefs held by society (Naim et al., 2022). In fact, the architecture of traditional houses built and lived in by the community is related to science or modern science (Fauzi et al., 2022). In other words, student-centered and contextually based science learning can reduce students' misconceptions about correct concepts according to experts (Sari et al., 2024).

## Conclusion

Ethnoscience learning is proven to have a positive influence on the development of learning outcomes in the cognitive and affective aspects of junior high school students at MTsN 1 Mataram.

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## Author Contributions

Conceptualization, H and I. W. S.; methodology, K. S. and A. A. I. A. R. S.; formal analysis, H and E. P. A.; investigation, H and E. P. A.; resources, H. and A. A. I. A. R. S.; data curation, H. and E. P. A.; writing—original draft preparation, H and I. W. S.; writing—review and editing, H. and K. S.; visualization, I. W. S. and E. P. A. All authors have read and agreed to the published version of the manuscript.

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## Conflicts of Interest

No conflicts of interest.

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