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Ethno-science Approach in Making Bamboo Lemang Materials: Implications of Understanding the Concept of Thermal Energy

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ABSTRACT

This study aims to analyze the influence of ethno-science approach through the making of bamboo lemang in improving students' understanding of the concept of thermal energy material at SMPN 17 South Bengkulu. This study uses a quantitative approach with a quasi-experiment method and a Non-Equivalent Control Group design. Creswell states that a pseudo-experiment is an experimental situation in which the researcher assigns, but not randomly, participants to a group because the researcher cannot artificially create a group for the experiment. Data were collected through concept comprehension tests and observations. The results of the study showed a significant improvement in the understanding of students who used the ethno-science approach compared to conventional methods. Based on the results of the normality test with Shapiro-Wilk, it showed a significance value of 0.129 (experimental class) and 0.067 (control class), which means that the data is normally distributed. Based on the results of the homogeneity test with Levene's Test resulting in a significance value of 0.611, indicating that the data variance between the experimental and control groups was homogeneous. Based on the results of the hypothesis test using Independent Samples t-Test, it showed a t-value (-5.42) with p = 0.000, which means that there was a significant difference between the two groups. The average understanding of students in the experimental class was 83.07, while in the control class it was 66.13.These results show that the ethno-science approach through the making of bamboo lemang contributes positively to improving the understanding of the concept of thermal energy.

Keywords: *Ethno-science, Bamboo Lemang and Heat energy*

INTRODUCTION

Science education has an important role in building students' understanding of natural phenomena and their application in daily life. However, in many schools, science learning is still considered difficult and less attractive to students. (Hearn, 2024) This is due to the conventional learning method, where scientific concepts are taught in the abstract without being related to students' real experiences (Nurrubi et al., 2022). One approach that can be applied to overcome this challenge is the ethno-science approach, which integrates local culture in science learning to be more contextual and meaningful The ethno-science approach connects science with the traditions and cultures of the local community, so that students can more easily understand science concepts through experiences that are close to their lives (Jufrida, 2020). One of the traditions that can be used as a learning medium is the making of bamboo lemang. Bamboo lemang is a traditional food that is cooked by utilizing the principles of heat energy, such as conduction, convection, and radiation. This process is in accordance with the heat energy material taught in junior high school,

so that it can be used as a more interesting and applicable practice-based learning tool for students (Charoenphun & Wangtueai, 2020).

In South Bengkulu, especially among the Serawai tribal community, bamboo lemang has a deep cultural meaning and is part of various traditional ceremonies and holiday celebrations. This tradition is not just a culinary activity, but also reflects the value of mutual cooperation and respect for ancestors (Dihamri et al., 2021). Integrating the process of making bamboo lemang in science learning can be an innovative approach that connects theory with practice. In education, this method helps students understand the concepts of heat energy, heat transfer, and changes in the form of substances directly. The process of cooking lemang involves transferring heat from fire to bamboo, which can be explained by conduction theory (Edward, 2020). In addition to improving understanding of science, this approach also supports the preservation of local culture. Constructivism theory emphasizes that meaningful learning occurs when students connect new knowledge with previous experiences. Thus, the use of lemang in science learning not only enriches science but also instills awareness of the importance of preserving regional traditions (Chaer et al., 2021).

Several previous studies have highlighted the importance of ethno-science approaches in improving students' understanding of scientific concepts. According to Hasan.S.H., (2023), "The application of ethno-science in science learning has been shown to increase students' interest and involvement in understanding abstract concepts." Meanwhile, research by Iskandar et al., (2022) found that the use of local culture in science learning helps students connect theory with real practice, so that learning becomes more meaningful. However, until now, research that specifically examines the use of bamboo lemang in learning heat energy is still very limited. Most ethno-science research emphasizes the study of culture in general without connecting it with the concept of physics in depth. This makes this research unique because it not only expands the application of ethno science, but also makes a real contribution in utilizing the local culture of South Bengkulu as an innovative learning tool. As an alternative, this study seeks to fill the gap of previous research that has not explored the making of bamboo lemang as a science learning medium that is integrated with the ethno science approach. In addition, this research is expected to provide a new perspective on how local culture is not only a heritage that must be preserved, but can also be used as a means of modern education.

Based on initial data obtained from SMPN 17 South Bengkulu, students' understanding of the concept of thermal energy is still relatively low, with only about 50% of students achieving scores above the Minimum Completeness Criteria (KKM). One of the main factors that causes this low understanding is the lack of contextual and relevant learning methods for students' daily lives. Abstract learning often makes it difficult for students to connect theory with real experience, so that their understanding of the concept of thermal energy becomes less than optimal (Mukti et al., 2022). Therefore, this study aims to examine the influence of ethno-science approach through the making of bamboo lemang in improving students' understanding of the concept of thermal energy. By applying this approach, learning is expected to be more interesting and interactive, so that students can more easily understand the concepts learned. In addition, this activity can also increase students' motivation in learning science because they are directly involved in practical activities related to local culture. The ethno-science approach not only contributes to the improvement of understanding of the concept of thermal energy, but also to the preservation of local wisdom among the younger generation (Wati, 2021).

The approach in this study aims to create a more fun and interactive learning atmosphere. By involving students in practical activities such as making bamboo lemang, they will more easily interact with the subject matter and relate it to their personal experiences. In addition, this activity also provides added value in the form of local cultural preservation which can be increasingly understood and appreciated by the younger generation. The context of this research focuses on the students of SMPN 17 South Bengkulu, who are in an area with a culture of making bamboo lemang that is still preserved. The unit of analysis in this study is students who take part in science

learning with ethno-science methods based on direct practice. The methods used in this study include an experimental approach by comparing students' understanding before and after the application of this method.

METHODOLOGY

This study uses a quantitative approach with quasi-experiment and design methods **Non-Equivalent Control Group Design** (W.Creswell., 2018). Creswell states that a pseudo-experiment is an experimental situation in which the researcher assigns, but not randomly, participants to a group because the researcher cannot artificially create a group for the experiment. The ethnoscience approach through the making of bamboo lemang was applied to the experimental group, while the control group used conventional learning methods. The effectiveness measurement was carried out through a posttest to compare the understanding of the concept of thermal energy between the two groups. Data were collected through tests and analyzed to see the influence of ethnoscience approaches on improving students' understanding of science.

The population in this study is all grade VIII students at SMPN 17 South Bengkulu, because thermal energy material is part of the curriculum taught at this level. The research sample consisted of two classes selected using *the purposive sampling* technique, namely class VIII A as a control group consisting of 30 students and class VIII B as an experimental group which also consisted of 30 students, so that the total number of samples in this study was 60 students. The *purposive sampling technique* was chosen with the consideration that the classes used have equivalent academic characteristics, so that the research results can be more valid and can provide a more accurate picture of the influence of the science approach on the understanding of the concept of thermal energy. In this study, the experimental class received learning with an ethnoscience approach through the making of bamboo lemang, while the control class continued to use conventional learning methods. The selection of this technique allows the research to focus more on measuring the difference in learning outcomes based on the applied approach.

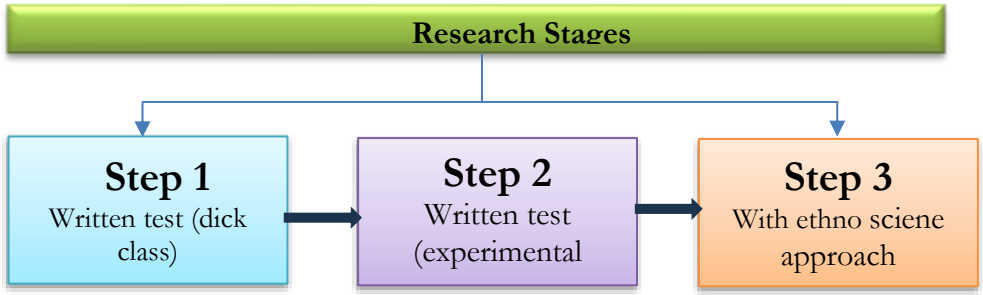

Chart 1. Data trust level steps

This study uses three data collection techniques, namely written tests (posttest questions) to measure students' understanding before and after the application of the ethnoscience approach through the manufacture of bamboo lemang, observation to assess student involvement in learning, and documentation as supporting data. The research instruments consisted of a concept comprehension test, which was used to measure the improvement of students' understanding of the concept of thermal energy, as well as an observation sheet to assess students' activities during the learning process with an ethnhoscience approach. Before the test sheet is given, the question sheet and question instruments are first tested to determine the level of validity, and reliability. From the validity and reliability test, the data analysis was carried out through several stages, namely descriptive statistics to describe student learning outcomes, normality test to ensure data distribution in accordance with statistical assumptions, homogeneity test to see the similarity of variance between groups, and hypothesis test using Independent Sample t-Test using IBM SPSS output Statistical Surveillance 25, To find out whether the ethnoscience approach through the making of bamboo lemang has a significant effect on the understanding of the concept of thermal energy compared to conventional learning methods.

RESULT AND DISCUSSION

Based on the results of research, experiments, and test of question instruments carried out by grade VIII students, it is known that the process of making bamboo lemang is carried out traditionally and has been inherited from generation to generation by the community in South Bengkulu. This tradition reflects local wisdom in processing food using natural ingredients, such as bamboo, glutinous rice, and coconut milk, as well as applying the principle of heat transfer through conduction and radiation in the ripening process.

1. Bamboo cutting

2. Bamboo drying

3. Put glutinous rice into bamboo

4. Add coconut milk

5. Bamboo lemang burning

Figure 1. The process of making bamboo lemang

From Figure 1, it can be seen that the process of making bamboo lemang begins with cutting the bamboo according to the desired size. After that, the bamboo that has been cut is dried to reduce the moisture content in it, so it is more optimal when used as a cooking container. The next step is to put the sticky rice that has previously been washed into the bamboo. After glutinous rice is added, coconut milk is poured into bamboo to give it a savory taste and improve the texture of lemang. The final stage in this process is the burning of bamboo that has been filled with glutinous rice and coconut milk on a fire using traditional methods. The burning process is carried out evenly by rotating the bamboo so that the lemang is cooked perfectly without burning (Puspasari et al., 2020). The traditional pattern in making bamboo lemang turns out to contain a lot of the concept of heat energy due to temperature differences, with the main mechanisms in the form of conduction, convection, and radiation. In making bamboo lemang, the concept of heat energy is clear, where the heat from the fire transfers to the bamboo and its contents through conduction, the heat from coconut milk to rice transfers through convection, and the heat from the fire spreads to the surface of the bamboo through radiation (Setyoko, 2022).

The following are the results of the reconstruction of the conceptual understanding of thermal energy that has been carried out by class VIII in two groups, namely the experimental class and the control class which leads to the influence of the use of the ethno science approach on the two classes.

Normality Test

The normality test aims to determine whether the collected data is normally distributed or not. Normal distributions are a basic assumption in many parametric statistical analyses. In this study, the Shapiro-Wilk Test was used. (Quraish, 2020). The application of the Shapiro-Wilk test will help ensure that the data collected meet the assumptions of normality required for parametric statistical analysis (Zakirman, 2020). The Shapiro-Wilk test is a statistical method designed to test whether a data set comes from a normal distribution. This test is very effective and valid to use especially for small samples, generally less than <50 data. The Shapiro-Wilk test procedure involves testing the null hypothesis (H_0) which states that the data is normally distributed, countering the

alternative hypothesis (H_1) which states otherwise. After calculation, if the resulting p-value is greater than the specified significance level (e.g., >0.05), then H_0 received, which means that the data is considered normally distributed. Conversely, if the p value is less than <0.05, H_0 rejected, indicating that the data is not normally distributed (Sari et al., 2024).

Table 1. Normality Test Results

Tests of Normality							
Class					Shapiro-Wilk		
					Statistics	Df	Sig.
Result	Control Class A	0,162	30	0,044	0,935	30	0,067
	Experimental Class B	0,171	30	0,025	0,946	30	0,129

a. Lilliefors Significance Correction

In this study, the normality test was carried out using *Shapiro-Wilk,* because the number of samples was less than <50 students. Based on the results of *the Shapiro-Wilk test*, a significance value of 0.129 for the experimental class and 0.067 for the control class was obtained. Because the significance value of the two groups is greater than >0.05, it can be concluded that the data is normally distributed, so that the Independent Samples t-Test can be used."

Homogeneity Test

The homogeneity test is a statistical procedure that aims to test the similarity of variance between data groups. This assumption of variance homogeneity is very important in various parametric statistical analyses, such as Variance Analysis (ANOVA) and t-test, where the similarity of variance between groups is a key prerequisite for the validity of the analysis results (Usmadi, 2020). By ensuring that the variance between the groups is homogeneous, researchers can improve the accuracy and reliability of the conclusions drawn from the data. There are several methods that are commonly used to test the homogeneity of variances, including the *Levene* and Test *Bartlett.*

Table 2. Homogeneity Test Results

Test of Homogeneity of Variance					
		Levene Statistic	df1	DF2	Sig.
Control	Based on Mean	0,682	4	24	0,611
	Based on Median	0,315	4	24	0,865
	Based on Median and with adjusted df	0,315	4	19,324	0,865
	Based on trimmed mean	0,650	4	24	0,632

In this study, the homogeneity test was carried out using Levene's Test, because it is more robust against data that is not completely normal."" Based on the results of the Levene's Test, a significance value of 0.611 was obtained. Since this value is greater than >0.05, it can be concluded that the variance of the data between the experimental and control groups is homogeneous, so that the Independent Samples t-Test can be used.

Hypothesis Test Results

The hypothesis test in this study uses an independent sample t-test to compare the posttest results between the experimental group and the control group. This test aims to find out if there is a significant difference in students' understanding of concepts after being treated with an

Ethnoscience approach through the making of bamboo lemang. In contrast to the study that used pretest and posttest, this study directly compared the posttest results of the two groups to see the effectiveness of the approach applied. The decision-making criteria in this test are based on a significance value (p-value) of 0.05 (5%) (Sari et al., 2024).

- If the significance value < 0.05, then H_0 is rejected and H_a is accepted, which means that there is a significant difference between the experimental group and the control group, so that the Ethnoscience approach is proven to have an effect on students' understanding of concepts. Instead
- if the significance value ≥ 0.05, then H_0 accepted and H_a rejected, which showed that there was no significant difference between the two groups, so the Ethnoscience approach did not have a significant influence on students' conceptual comprehension (Putri et al., 2022).

Group Statistics

CLASS		N	Mean	Std. Deviation	Std. Error Mean
RESULTS OF THE RESEARCHER'S SCORE	CONTROL	30	66,13	15,393	2,810
	EXPERIMENTAL	30	83,07	7,478	1,365

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
HASIL PENELITIAN	Equal variances assumed	6,835	,011	-5,420	58	,000	-16,933	3,124	-23,188	-10,679
	Equal variances not assumed			-5,420	41,967	,000	-16,933	3,124	-23,239	-10,628

Table 3. Independent Samples t-Test

After conducting the normality test and homogeneity test, the next step is the Independent Samples t-Test. This test was used to compare the mean of two different groups (experimental class and control class) after the treatment was given. The Independent Samples t-Test was used to determine whether there was a significant difference between the two independent groups (experimental vs. control) in understanding the concept of thermal energy.

The results of the Independent Samples t-Test showed a t-value (-5.42) with p = 0.000, which is smaller than <0.05. This means that there are significant differences between the experimental and control groups in their understanding of the concept of thermal energy. The average understanding of students in the experimental class (83.07) was higher than that of the control class (66.13). These results indicate that the Ethno-Science approach through bamboo lemang making activities contributes positively to improving students' understanding of the concept of thermal energy.

Figure 2. Processed bamboo lemang

This study aims to examine the application of ethnoscience approaches in the process of making bamboo lemang and its implications for understanding the concept of thermal energy (Diani et al., 2020). The ethnoscience approach integrates local cultural knowledge and practices into science learning, so that students can understand scientific concepts through cultural contexts close to their lives. In this case, the making of traditional bamboo lemang which involves the process of cooking glutinous rice in bamboo is a learning medium to teach the concept of heat energy (Dewi & Ibrahim, 2019). By linking the process of making bamboo lemang to science learning, students are expected to be able to connect their daily experiences with scientific theories, thereby increasing their understanding and appreciation of science. In addition, this approach also contributes to the preservation of local wisdom, as students not only learn science concepts, but also understand and appreciate their own culture. This integration is in line with efforts to create contextual and meaningful learning, which can improve student motivation and learning outcomes (Nurrubi et al., 2022).

The importance of this research lies in efforts to connect traditional cultural practices with modern science concepts, so that learning becomes more relevant and interesting for students (Mukti et al., 2022). The ethno science approach allows students to understand scientific concepts through cultural contexts that are close to their lives, facilitating more meaningful and contextual learning. Thus, students can relate science knowledge to everyday experience, which in turn increases their motivation and understanding of the material being taught (Rusman, 2023). The main contribution of this research is to provide a learning framework that combines traditional knowledge with the concept of thermal energy, which can be used as a model in the development of ethnoscience-based teaching materials. This framework is designed to assist educators in compiling learning materials that not only teach science concepts, but also appreciate and preserve local wisdom (Wati, 2021).

The results of the study show that the process of making bamboo lemang involves several concepts of heat energy, such as heat conduction through bamboo, insulation by banana leaves, and evaporation of water from coconut milk which helps control temperature (Frayon et al., 2024). In addition, the integration of the process of making bamboo lemang in science learning has proven to be effective in increasing students' understanding of the concept of thermal energy. In addition, the gelatinization process occurs when the starch granules in glutinous rice swell due to the heat and liquid from the coconut milk, changing the texture and taste of the lemang (Sholichah et al., 2020). The integration of the bamboo lemang making process in science learning has proven to be effective in improving students' understanding of the concept of thermal energy. This approach not only makes learning more contextual and relevant, but also helps preserve local wisdom in the context of science education (Ardana et al., 2023).

These findings are in line with previous research that suggests that ethnoscience approaches can improve students' understanding of science concepts. For example, a study by (Yuliyanti, 2024). indicates that the ethnoscience approach enriches students' science learning experience by taking into account their cultural and social contexts. In addition, research by (Suaidin, 2022). emphasizing the importance of integrating local wisdom in science learning to empower students' potential through learning activities involving observation and discovery. In this study, all the results obtained are in accordance with the initial hypothesis that the integration of the bamboo lemang

making process in science learning can improve students' understanding of the concept of thermal energy. That is, there are no unexpected findings; All results support the initial assumption that the ethnoscience approach through traditional cultural practices is effective in deepening students' understanding of thermal energy.

The implications of this study include several important aspects. First, in the field of education, the integration of local wisdom such as making bamboo lemang into science learning can make the material more relevant and interesting for students, thereby increasing their motivation and understanding of scientific concepts (Comission, 2020). This is in line with research that shows that science learning based on local wisdom can improve the quality of learning and preserve local culture (Kelana et al., 2021). Second, in terms of cultural preservation, this approach helps the younger generation recognize and appreciate their cultural heritage, which contributes to efforts to preserve local traditions. By involving local culture in education, students learn about their culture through science, thereby better appreciating and preserving the tradition, preventing the loss of local culture over time (Zuhdan, 2021).

CONCLUSION

Based on the results of the research, it can be concluded that the ethno-science approach through the making of bamboo lemang significantly improves students' understanding of the concept of thermal energy at SMPN 17 South Bengkulu. The results of the statistical test showed that there was a significant difference between the experimental group that used the ethno-science approach and the control group that still used conventional learning methods. Based on the statistical test, the value of the normality test with the Shapiro-Wilk *test* was obtained, a significance value of 0.129 for the experimental class and 0.067 for the control class. Since the significance value of the two groups is greater than >0.05, it can be concluded that the data are normally distributed. Based on the results of the homogeneity test using *the Levene's Test*, a significance value of 0.611 was obtained. Since this value is greater than >0.05, it can be concluded that the variance of the data between the experimental and control groups is homogeneous. Based on the results of the hypothesis test using the *Independent Samples test, the t-Test* showed a value of t (-5.42) with p = 0.000, which is smaller than <0.05. This means that there are significant differences between the experimental and control groups in their understanding of the concept of thermal energy. The average understanding of students in the experimental class (83.07) was higher than that of the control class (66.13). These results indicate that the Ethno-Science approach through bamboo lemang making activities contributes positively to improving students' understanding of the concept of thermal energy.

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REFERENCES

Ardana, H. P., Ilhami, A., Diniya, D., & Munawwarah, M. (2023). Identification of Ethnoscience in Malomang Local Wisdom as a Science Learning Resource. *Journal of Chemistry Education and Integration*, *2*(1), 10. https://doi.org/10.24014/jcei.v2i1.21686

Chaer, P., Culture, B., As, L., & Character, I. P. (2021). *LOCAL CULTURE-BASED SCIENCE LEARNING AS AN INTRODUCTION Science or science is one of the sciences that must be possessed by humans. Especially in the era of globalization like this, the development of science and technology is very rapid and developing. II*, 35–42.

Charoenphun, N., & Wangtueai, S. (2020). *Development of Sticky Rice in Bamboo for Value-added Local Agricultural Products in Sakaeo Province Area*. pp. 48–58.

Commission, E. (2020). *Integration of Local Wisdom in the Science Curriculum in Elementary Schools: A Systematic Literature Review*. *4*(1), 1–23.

Dewi, S. Z., & Ibrahim, T. (2019). The Importance of Understanding Concepts to Overcome Misconceptions in Science Learning Materials in Elementary Schools. *UNIGA Journal of Education*, *13*(1), 130–136. http://dx.doi.org/10.52434/jpu.v17i1.2 553

Diani, S. F., Maulidiya, D., & Susanta, A. (2020). The ability to understand the concepts of junior high school students after obtaining doscovery learning. *Journal of School Mathematics Learning Research* Journal, *3*(3), 362–373.

Dihamri, Geography, P., University, F., & Bengkulu, S. H. (2021). *LOCAL SERAWAI TRIBE IN KEARIFAN REGENCY*. pp. 82–92.

Edward. (2020). The Function of Lemang in the Besemah Tribe Marriage Ceremony in Kaur Regency, Bengkulu Province. *Journal of Historical and Cultural Research*, *5*(2), 235–256. https://doi.org/10.36424/jpsb.v5i2.141

Frayon, S., Swami, V., Wattelez, G., Nedjar-Guerre, A., & Galy, O. (2024). Associations between academic achievement and weight status in a multi-ethnic sample of New Caledonian adolescents. *PloS One*, *19*(10), e0309782. https://doi.org/10.1371/journal.pone.0309782

Hasan.S.H. (2023). *Ethnoscience: Culture-Based Learning Strategies and Local Wisdom. 1*, 106–116.

Hearn, J. (2024). Evaluating the concept of political masculinity/ies: a simple idea or a case of too many ideas? *European Journal of Politics and Gender*, *7*(3), 326–344. https://doi.org/10.1332/25151088y2023d000000021

Iskandar, H., Sudarmin, Susilo, & Aji, M. P. (2022). How Research Trends On Ethnoscience In Science Learning? A Systematic and Scoping Review Of Empirical Studies. *International Conference on Science, Education and Technology*, 474–483. https://proceeding.unnes.ac.id/index.php/iset

Jufrida, J. (2020). *2020 Techno-Ethno Research Report*.

Kelana, J. B., Wardani, D. S., & Wulandari, M. A. (2021). Ethnoscience as a Learning Resource in Elementary School. *JIKAP PGSD: Scientific Journal of Educational Sciences*, *5*(1), 74. https://doi.org/10.26858/jkp.v5i1.16822

Mukti, H., Suastra, I. W., & Aryana, I. B. P. (2022). Integration of Ethnoscience in science learning. *JPGI (Indonesian Journal of Teacher Research), 7*(2), 356–362.

Nurrubi, H. M., Nurfadilah, V. A., & Latip, A. (2022). Local Wisdom from an Ethnoscience Perspective and Its Relation to Science Learning. *UNIGA Education Journal*, *16*(2), 623. https://doi.org/10.52434/jpu.v16i2.2022

Puspasari, A., Susilowati, I., Kurniawati, L., Utami, R. R., Gunawan, I., & Sayekti, I. C. (2020). Implementation of Ethnoscience in Science Learning at Elementary School of Muhammadiyah Alam Surya Mentari Surakarta. *SEJ (Science Education Journal), 3*(1), 25–31. https://doi.org/10.21070/sej.v3i1.2426

Putri, H., Susiani, D., Wandani, N. S., & Putri, F. A. (2022). Cognitive Learning Outcome Assessment Instruments on Descriptive Tests and Objective Tests. *Papeda Journal: Journal of Elementary Education Publications*, *4*(2), 139–148. https://doi.org/10.36232/jurnalpendidikandasar.v4i2.2649

Quraish. (2020). *Shapiro Wilk Normality Test*. 5–17.

Rusman. (2023). Learning Models Strengthen Teacher Professionalism. *PT. Raja Grafindo Persada*, *02*, 201.

Sari, A. P., Hasanah, S., & Nursalman, M. (2024). *Test of Normality and Homogeneity in Statistical Analysis*. *8*(2012), 51329–51337.

Setyoko, B. (2022). *EVALUATE THE PERFORMANCE OF THE HEAT EXCHANGER BY THE FOULING FACTOR METHOD*. 6667 http://jurnal.fkip.uns.ac.id/index.php/prosfis1/article/view/3316

Sholichah, E., Kumalasari, R., Afifah, N., Indrianti, N., Nurintan, F., & Rahayuningtyas, A. (2020). *The Effect of Cooking Method and Preservative on Storage Time of Lemang (Rice Bamboo)*. pp. 149–160.

Suaidin. (2022). *INTEGRATION OF LOCAL WISDOM IN SCIENCE LEARNING*. https://suaidinmath.wordpress.com/2014/07/14/tahapan-kegiatan-pengawasan/

Usmadi, U. (2020). Analytical Requirements Testing (Homogeneity Test and Normality Test). *Educational Innovation*, *7*(1), 50–62. https://doi.org/10.31869/ip.v7i1.2281

W.Creswell., J. (2018). Qualitative, Quantitative, and Mixed-Methods Research. *Microbe Magazine*, *4*(11), 485–485. https://doi.org/10.1128/microbe.4.485.1

Wati, E. (2021). Literature Studies: Ethnoscience in Science Learning. *Raden Intan State Islamic University Lampung*, *1*, 1–130. http://repository.radenintan.ac.id/id/eprint/13951

Yuliyanti. (2024). *Ethnoscience Approach in Science and Technology Learning for Inclusive Science Literacy in Elementary Schools: A Literature Review*. *13*(3), 2777–2788.

Zakirman, Z. (2020). *Introduction to Social Statistics*. STKIP PGRI West Sumatra Press.

Zuhdan, P. (2021). Science Learning Based on Local Wisdom. *PROCEEDING: National Seminar on Physics and Physics Education*, *2*(1), 246–256. http://jurnal.fkip.uns.ac.id/index.php/prosfis1/article/view/3316