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Local wisdom integration in science learning through culturally responsive teaching on students' learning interests

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ABSTRACT

Science learning in schools still tends to be abstract and lacks a connection between the material and students' daily life contexts, resulting in low learning interest. This study is intended to investigate the influence of local wisdom-based science learning through the Culturally Responsive Teaching approach on students' learning interest. It is a quantitative study that has a quasi-experimental design and a non-equivalent control group design with 37 seventh-grade students of MTs. N 3 Parigi, a total of twenty participants were included in the experimental group, and seventeen participants were allocated to the control group. A Likert scale questionnaire with 16 validated statement items measured learning interest data, which were analyzed with the Mann-Whitney U test. The analysis showed that the experimental group achieved a greater mean rank of 23.45 than the control group of 13.76, and the observed difference was significant in statistical terms ($p = 0.007$, $p < 0.05$). Learning that connects science concepts with local cultural contexts makes learning more relevant and meaningful for students, thereby encouraging higher emotional and cognitive engagement. This study concludes that local wisdom-based science learning through the Culturally Responsive Teaching approach has a significant effect on students' learning interest.

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INTRODUCTION

Science education serves as a foundational pillar in cultivating students' scientific thinking skills, critical attitudes, and environmental awareness. However, the reality in the field indicates that science learning is still frequently delivered abstractly, dominated by the teacher, and insufficiently connected to students' real-life experiences, which directly contributes to low student interest in science learning (Sappe et al., 2018; Negara et al., 2021). This condition is reflected in various

research findings suggesting that students' interest in science learning remains in the low category (Maulina et al., 2022). This finding is consistent with the results of previous studies, which revealed that the majority of students experience difficulties in understanding science concepts, with low learning interest and motivation, as well as teacher-dominated instruction, identified as the primary contributing factors (S. Amaliyah et al., 2024).

One approach that is considered relevant in addressing this issue is local wisdom-based learning. Local wisdom contains values, knowledge, and cultural practices that develop within society and can be utilized as learning resources that are close to students' lives (Pamenang, 2021). The utilization of local wisdom in science learning has been proven to provide positive effects on concept understanding, scientific attitudes, and environmental awareness(Simon et al., 2023). Learning that is connected to students' daily experiences tends to make them more engaged and interested in participating in the class activity.

Beyond local wisdom, the Culturally Responsive Teaching (CRT) approach further strengthens the foundation for meaningful science learning by positioning students' cultural backgrounds as the basis for designing instruction. This approach views culture as pedagogical capital that can be utilized to present learning that is meaningful, inclusive, and relevant to students' lives (Gay, 2018). Various studies show that applying the Culturally Responsive Teaching approach enhances students' motivation, involvement, and learning interest because it enables them to feel respected and actively engaged in classroom activities (Wulandari et al., 2023).

Although local wisdom-based learning and the Culturally Responsive Teaching approach have been widely studied separately, research that integrates both in science learning is still limited, particularly studies examining students' learning interests. Most research emphasizes learning outcomes or critical thinking skills, while learning interest as an affective aspect that plays an important role in learning success has not been extensively discussed in depth (Harackiewicz et al., 2018). Therefore, research is needed that specifically examines the impact of local wisdom-based science learning through the Culturally Responsive Teaching approach on students' learning interest.

The originality of this study is that it has incorporated local wisdom as a science learning resource with the Culturally Responsive Teaching approach as a pedagogical framework. The combination of these two approaches is expected to present science learning that is not only contextual, but also responsive to the cultural background of the students in such a way that the learning process becomes more meaningful, involving and more connected with the lives of the students.

Based on these conditions, the main problem in current science learning lies in the lack of optimal connection between the material and students' cultural contexts and daily lives, making learning feel distant from their real experiences and affecting their learning interest. On the other hand, local wisdom-based learning and the Culturally Responsive Teaching approach have been widely studied separately, but their integrated application in science learning, particularly examining their effect on students' learning interest, has not been extensively researched. Therefore, this study attempts to evaluate the extent to which local wisdom-oriented science instruction through the Culturally Responsive Teaching framework influences students' learning interest.

RESEARCH METHODS

Research Design

This study utilizes a quasi-experimental quantitative design, specifically a non-equivalent control group design, comprising two classes assigned as the experimental and control groups (Supriatiningtyas et al., 2025). Both groups were given a pretest and a posttest. At the beginning of the sessions, both groups were given a learning interest questionnaire as a pretest to determine the students' initial conditions. The experimental group experienced science instruction that

incorporated elements of local wisdom, implemented within the framework of Culturally Responsive Teaching. Meanwhile, the control group continued to receive instruction in accordance with the standard teaching procedures commonly implemented at the school (conventional learning). After the entire learning series was completed, both groups were again given the same learning interest questionnaire as a posttest. The posttest was given to determine the effect of the learning treatment that had been provided on students' learning interest.

Table 1. Non-Equivalent Control Group Research Design

Group	Pretest	Treatment	Posttest
Experimental	O_1	X_1	O_2
Control	O_3	X_2	O_4

Description :

X_1 : Treatment in the form of science learning that integrates local wisdom through the *Culturally Responsive Teaching* approach

X_2 : Conventional learning

O_1 : Pretest for the experimental group

O_2 : Posttest for the experimental group (after treatment)

O_3 : Pretest for the control group

O_4 : Posttest after treatment for the control group

Population and Samples

This study included all seventh-grade students of MTs N 3 Parigi as the research population. The study involved two classes as the research sample, namely Class VII A and Class VII D. Class VII A served as the experimental group of 20 students, and Class VII D served as the control group of 17 students. The sampling method applied is purposive sampling. The section of the sample selection is dependent on the consideration that both classes have relatively equivalent characteristics in terms of learning processes and academic abilities, making them suitable to serve as comparison groups. (Tajik et al., 2024).

Instruments

The instrument used in this study is a learning interest questionnaire with a Likert scale. The questionnaire consists of 16 statement items, which include positive and negative statements. Before use, the questionnaire went through a validation process by expert validators to ensure the feasibility and suitability of the instrument with the research objectives. The learning interest questionnaire was developed based on learning interest indicators according to Slameto, which include students' feelings of pleasure, interest, attention, and involvement (Trygu, 2021).

The indicator of feeling of pleasure was elaborated through statement items that describe students' affective responses toward science learning on the topic of plant classification integrated with local wisdom, for instance, whether students feel enthusiastic and enjoy the learning process when plants familiar to their traditions and daily lives are used as the context for learning. Furthermore, the indicator of interest was represented by items that reveal students' curiosity and intrinsic drive to explore the topic of plant classification more deeply, such as the desire to understand the classification of plants commonly used in traditional medicine, customary ceremonies, and local agricultural practices in their environment. The indicator of attention was measured through statement items reflecting students' level of concentration and focus during the learning process, for example, whether the Culturally Responsive Teaching approach, which incorporates locally familiar plants as learning examples, effectively helps students direct their attention more easily toward the subject matter being studied. Meanwhile, the indicator of

involvement was reflected in items describing students' active participation throughout the learning process, such as their willingness to engage in activities of identifying and classifying plants native to their region, as well as discussing the connection between those plants and the local wisdom values that exist within their community.

Procedures

The study's implementation consisted of three main phases: planning, execution, and finalization. In the planning phase, the process was initiated by determining the research title by reviewing several relevant journal articles. Subsequently, the researcher conducted observations at MTs. N 3 Parigi as the research location to obtain an initial overview of the science learning process taking place at the school, and to formulate the research problem. This is also the time that the researcher came up with research instruments, such as a learning interest questionnaire, and helped create learning material as teaching modules and Student Worksheets (LKPD), containing material on plant classification according to local wisdom using the Culturally Responsive Teaching approach. The local wisdom integrated into the learning is the traditional knowledge of the Bolano Tribe in Bolano District, Parigi Moutong Regency, Central Sulawesi Province, particularly in the utilization of local plants. This study uses two types of plants that are close to the lives of local communities. First, the sago plant (*Metroxylon sagu*), which is processed into a traditional food called Labol. The sago plant is used as a concrete example of monocotyledonous plants, where students can observe distinctive characteristics such as unbranched stems, fibrous root systems, and parallel leaf venation (Dalimunthe et al., 2019). Second, the bangkara plant (*Lantana camara L.),* which is traditionally used by the Bolano Tribe to treat cuts by applying the squeezed water from its leaves. This shrub plant contains active compounds such as saponins, phenols, and flavonoids. (Sitti et al., 2024). This traditional plant is used as an example of dicotyledonous plants while introducing the concept of ethnobotany to students. The selection of these two plants aims to connect scientific classification concepts with students' cultural contexts and daily lives.

Furthermore, in the implementation stage, it began with the administration of a learning interest questionnaire to both groups, namely the experimental class and control class, to determine the initial condition of students' learning interest. Subsequently, the experimental class was given treatment in the form of local wisdom-based science learning through the Culturally Responsive Teaching approach. Meanwhile, the control class group followed learning as usual (conventional learning). After the entire learning series was completed, both groups were again given the same learning interest questionnaire as a posttest to assess the impact of the instructional treatment on the learning interest of MTs. N 3 Parigi students. The final stage of the research includes processing the pretest and posttest data from the learning interest questionnaire, data analysis, and research results and discussion. This stage concludes with drawing conclusions based on the research findings obtained.

Data Analysis

The study involved analyzing data to establish variation in students' learning interests between the experimental and control classes. The objective of the study to attain information on the interest of the students to learn was achieved through the questionnaires that were completed by both classes. Comparison of the observations in this study will be done by use of a nonparametric statistical method, that is, the Mann-Whitney U test (Damanhuri et al., 2022).

Before hypothesis testing was carried out, this study first conducted a data normality test as an essential initial step. The purpose is to ensure that the statistical tool selected is truly appropriate to the characteristics of the data obtained (Sonjaya et al., 2025). The Shapiro-Wilk test was chosen as the appropriate instrument because the number of respondents in each group is

below fifty (Paramasivam et al., 2024). This choice is in line with methodological recommendations that suggest the use of this test for relatively small sample size conditions. Technically, Shapiro-Wilk works by comparing the pattern of actual score distribution with the theoretically expected normal distribution pattern. If the resulting significance value falls below 0.05, this can be interpreted as the analyzed data not following a normal distribution (Noermanzah et al., 2023).

In addition to normality testing, homogeneity testing is generally carried out to determine whether the variance between groups is equivalent. However, the homogeneity test is mainly required when using parametric statistical analysis. In this study, the results of the normality test indicated that the data were not normally distributed; therefore, hypothesis testing was conducted using a nonparametric approach. Consequently, the assumption of variance homogeneity was not considered a strict requirement in the analysis process.

If the results of the normality test indicate that the data on students' learning interests are not normally distributed, the basic assumption required for applying parametric statistical tests is not fulfilled. Under this condition, the independent t-test cannot be appropriately applied in the hypothesis testing stage. Therefore, this study employed the Mann–Whitney U Test, a nonparametric statistical test. This test is considered suitable because it is specifically designed to compare two independent groups without requiring the assumption of normal data distribution. Through the Mann–Whitney U test, the researchers can determine whether there is a statistically significant difference in students' learning interest between the groups being compared. (Wulansari, 2023).

RESULTS

The present study is designed on the pretest and posttest design to examine the effects of local learning science on the manifestation of the Culturally Responsible Teaching approach concerning the learning interest among the students. The obtained data were collected in the experimental and control classes and were analysed in terms of statistical tests suitable for the data distribution features. The data on the learning interests of the students were initially tested on the Shapiro-Wilk test before hypothesis testing was undertaken. Table 1 provides the findings of the normality test of pretest and posttest data between the two class groups. Pretest and Posttest Data Normality Test Results.

Table 2. Normality Test on Pretest and Posttest Scores Using Shapiro-Wilk

Class	Data Type	Statistic	df	Sig.	Remarks
Control	Pretest	0,863	17	0,017	Not normally distributed
Control	Posttest	0,975	17	0,894	Normally distributed
Experimental	Pretest	0,842	20	0,004	Not normally distributed
Experimental	Posttest	0,872	20	0,012	Not normally distributed

Table 2 indicates the result of normality tests of both the pretest and posttest samples of both groups of classes. Pretest and Posttest Normality Test Results (Shapiro-Wilk), Pretest data of the control and experimental classes get a significance value of 0.017 and 0.004, respectively, indicating that both pretest data are not normally distributed (Sig. < 0.05). Meanwhile, the control class posttest data shows a significance value of 0.894; it can be stated as normally distributed. Nevertheless, the posttest data of the experimental class got the significance value of 0.012, which shows that the data is not normally distributed. Consequently, it can be concluded on balance that part of the data does not respond to the normality assumption, hence the choice of the additional statistical tests should be adapted to the nature of the distribution of the data.

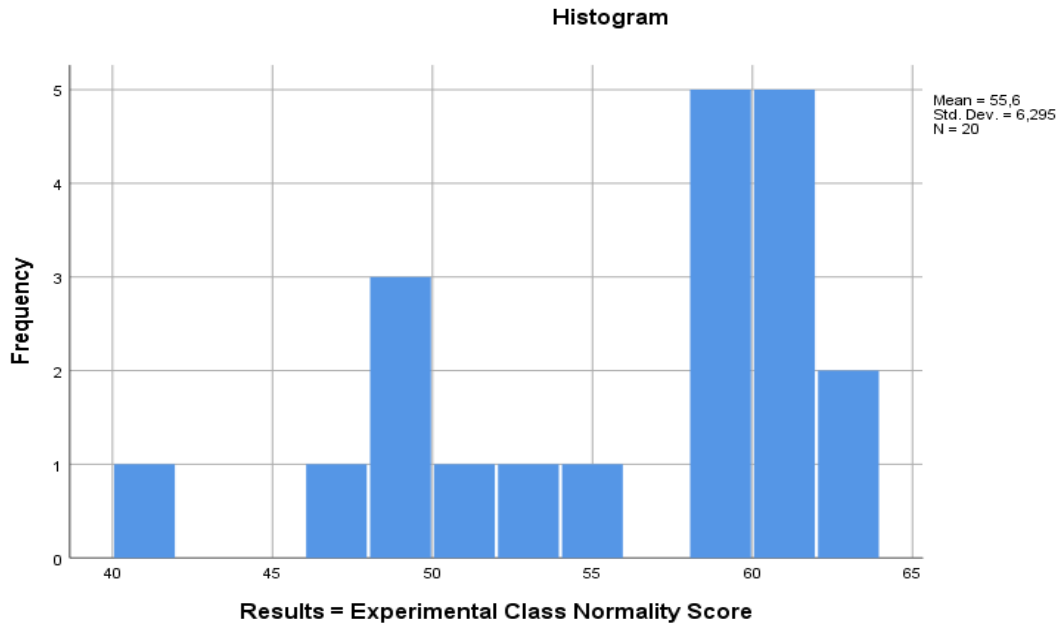

Figure 1. Histogram of Posttest Scores for Learning Interest in the Experimental Class

The score distribution of the experimental class is visualized in Figure 1. The histogram shows that the student learning interest data has a mean of 55.6 and a standard deviation of 6.295, with a total sample size of 20 students (N = 20). The highest frequency falls within the score range of 60–65, with 5 students each, followed by the score range of 48–50 with a frequency of 3 students, and the score ranges of 40–42, 46–48, 52–54, and 54–56 each with a frequency of 1 student. The data distribution tends to be negatively skewed, indicating that the majority of students scored above the mean.

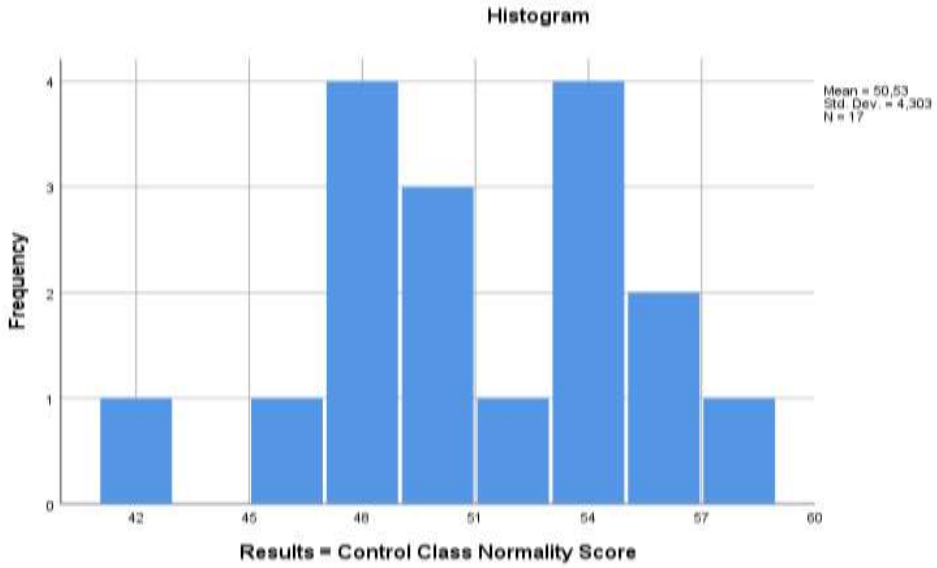

Figure 2. Histogram of Posttest Scores for Learning Interest in the Control Class

The score distribution of the control class is visualized in Figure 2. The histogram shows that the student learning interest data has a mean of 50.53 with a standard deviation of 4.303 and a total sample size of 17 students (N = 17). The highest frequency falls within the score ranges of 48 and 54, each with a frequency of 4 students, followed by the score range of 51 with a frequency of 3 students, the score range of 57 with a frequency of 2 students, and the score ranges of 42, 45,

52, and 60 each with a frequency of 1 student. The data distribution of the control class tends to be relatively symmetrical with a slight tendency toward being positively skewed.

When compared to the experimental class, there are several notable differences between the two classes. The experimental class has a mean of 55.6, which is higher than the control class at 50.53. Furthermore, the standard deviation of the experimental class at 6.295 is greater than that of the control class at 4.303, indicating that the data distribution of the experimental class is more varied. In terms of distribution shape, the experimental class tends to be negatively skewed, whereas the control class tends to be more symmetrical. These differences in the distribution patterns of both classes are consistent with the results of the Shapiro-Wilk normality test presented in Table 2, which serves as the basis for selecting the Mann-Whitney non-parametric test in this study.

Table 3. Mann–Whitney Ranking Results of Posttest Learning Interest Scores

Statistics	Class	N	Mean Rank	Sum of Ranks
Posttest Learning Interest Score Ranks	Experimental Class	20	23,45	469,00
	Control Class	17	13,76	234,00
	Total	37		

The posttest evaluation of students' learning interest reveals a marked difference between the experimental and control groups. As shown in Table 3, the experimental group attained a higher mean rank (23.45) with a cumulative rank score of 469.00, while the control group recorded a lower mean rank of 13.76 and a total rank score of 234.00. These results suggest that students who participated in the experimental learning intervention experienced a greater enhancement in learning interest following the instructional treatment.

Table 4. Mann-Whitney U Test Results of Students' Learning Interest Posttest Scores

Test Statistics	Learning Interest Posttest Scores
Mann–Whitney U	81,000
Wilcoxon W	234,000
Z	-2,719
Asymp. Sig. (2-tailed)	0,007
Exact Sig. [2*(1-tailed Sig.)]	0,006[b]

This disparity was further validated through the application of the Mann–Whitney U test. As reported in Table 4, the analysis produced a Mann–Whitney U statistic of 81.000, a Z value of −2.719, and an Asymp. Sig. (2-tailed) value of 0.007. Since the obtained significance value is below the conventional threshold of 0.05, the difference in posttest learning interest scores between the two groups is statistically significant.

The observed post-intervention difference in learning interest provides empirical evidence supporting the effectiveness of the instructional strategy employed. Compared with the control group, students in the experimental group exhibited substantially higher levels of learning interest after the intervention. These findings indicate that science learning grounded in local wisdom and implemented through a Culturally Responsive Teaching approach offers a viable and effective alternative to conventional instructional methods for fostering students' learning interest.

DISCUSSION

This study demonstrates that local wisdom-based science learning through the *Culturally Responsive Teaching* approach is capable of significantly enhancing students' interest in learning. This is evidenced through the Mann–Whitney U test, which was employed to compare posttest

learning interest scores between the experimental and control classes. This test was selected on the grounds that the obtained data did not satisfy the assumption of normal distribution, rendering a non-parametric statistical approach more appropriate for analyzing the differences between the two classes. The test results indicate that a statistically significant difference exists between both classes, with the experimental class achieving a notably higher mean rank compared to the control class. These findings suggest that the instructional treatment administered to the experimental class successfully fostered a more optimal improvement in students' learning interest.

The findings align with those reported by those of Amaliyah, Hayati, and Kasanova, who found that implementing local wisdom-based learning is effective in enhancing students' interest, enthusiasm, and engagement (N. Amaliyah et al., 2023). Although the study used a qualitative approach and was conducted in a madrasah context, the similarity in results shows that local wisdom has an important role in building students' emotional connection with learning materials. Learning that incorporates local culture not only strengthens students' cultural identity but also encourages active participation and a sense of ownership toward the learning process, which ultimately impacts the increase in learning interest.

The findings are congruent with previous research by Isna Rachma Nirmala, Murbangun Nuswowati, Bambang Subali, and Ellianawati, who asserted that the adoption of the Culturally Responsive Teaching approach in primary education contributes to increased student involvement, motivation, and overall learning experience by connecting the material with their cultural backgrounds (Nirmala et al., 2025). Although their study was based on a bibliometric review, the similarity in outcomes highlights the significant role of culturally responsive strategies in fostering meaningful interaction with learning content, promoting active participation, and nurturing a sense of ownership in the learning process.

Theoretically, the influence on students' learning interest in the experimental class can be explained through the basic principles of Culturally Responsive Teaching, which positions students' culture as the foundation in the learning process (Siahaan et al., 2025). When science learning is connected to students' daily experiences and cultural backgrounds, the learning process becomes more meaningful and easier to understand. This condition encourages students to be more emotionally and cognitively engaged in learning, thereby increasing learning interest. Conversely, conventional learning that lacks a connection between the material and students' cultural contexts tends to make learning feel abstract and less engaging.

In such a way, this study confirms the hypothesis that local wisdom-based science learning implemented through the Culturally Responsive Teaching approach can have a significant impact on the learning interest of students. This conclusion reinforces the past research findings and proves the efficiency of the concept of integrating local wisdom and the Culturally Responsive Teaching approach as a means of learning to enhance the quality of science learning, especially the affective aspects of science learning in students. This method could be applied as an alternative that is innovative in science learning, contextual, inclusive, and relevant to the characteristics of students.

CONCLUSION

The results of the present study demonstrate that science instruction integrating local wisdom within a Culturally Responsive Teaching framework has a significant effect on students' learning interest. This conclusion is supported by the higher average learning interest scores attained by the experimental group compared to the control group, as well as the Mann–Whitney U test results, which reveal a statistically significant difference between the two groups (Asymp. Sig. 2-tailed) = 0.007, $p < 0.05$). Consequently, the research hypothesis proposing that local wisdom–based science learning implemented through the CRT approach positively influences students' learning interest is accepted. These findings carry meaningful significance for the field of

education. For teachers in particular, this study can serve as a foundation for integrating local wisdom elements into science learning processes, especially in classrooms with diverse cultural backgrounds. This approach not only makes learning feel more relatable and meaningful for students but also has the potential to foster deeper engagement and motivation. For curriculum developers and educational policymakers, these findings may serve as a valuable consideration in designing learning experiences that are more contextual and responsive to local culture, given that such an approach is effective in enhancing students' interest in science learning.

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