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A comparative analysis of Bengkulu culture-integrated and non-culture-integrated problem-based learning worksheets on mathematical problem-solving skills among junior high school students

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Abstract.
This study was motivated by students' limited mathematical problem-solving skills, a situation attributed to the current use of Student Worksheets that primarily consist of descriptive problems, insufficient for fostering independent learning and lack integration of Bengkulu culture. The study aimed to compare the impact of using Problem-Based Learning (PBL)-based worksheets, specifically those incorporating Bengkulu culture versus those that did not—on the mathematical problem-solving skills of junior high school students. A quasi-experimental design with a non-equivalent control group (posttest-only) was employed. The study population comprised all Grade VII students at a public junior high school in Kepahiang Regency, Bengkulu. Purposive sampling was used to select two classes: Class VII A (experimental group 1, n = 26) and Class VII C (experimental group 2, n = 25). Data were collected via a mathematical problem-solving skill test. Hypothesis testing results indicated that students using the Bengkulu culture-integrated PBL worksheets demonstrated superior mathematical problem-solving skills compared to students using PBL worksheets without cultural integration.

Keywords:
Bengkulu culture; Mathematical problem-solving skill; student woeksheet; problem-based learning

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INTRODUCTION

Mathematics is a field of study that plays an important role in everyday life and contributes to the development of high-quality human resources. This is because mathematics contributes to various aspects of human life, including the advancement of science and technology (Depitasari et al., 2021). Therefore, mathematics should be taught at all levels of education because it equips students with the skill to solve various problems.

According to the Indonesian Ministry of National Education Regulation (Permendiknas), one of the objectives of mathematics education is to enable students to solve problems, which involves understanding the problem, developing a model, obtaining a solution, and interpreting the solution (Latifah & Luritawaty, 2020). Mathematical problem solving is a learning process that encourages students to participate actively in learning, enabling them to respond effectively to questions and overcome challenges encountered when solving problems (Sriwahyuni & Maryati, 2022). Therefore, mathematical problem-solving skill is essential for students at every level of education. This skill is not only an important objective of mathematics education but also helps students address problems encountered in real-life situations.

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Students' mathematical problem-solving skill in Indonesia remains relatively low. This is evidenced by the results of the 2022 Programme for International Student Assessment (PISA), which showed a 13-point decline in mathematics scores, from 379 points in 2018 to 366 points in 2022. Nevertheless, Indonesia's ranking improved by five positions compared with the 2018 PISA results (Kemendikbud, 2023). Given the low level of students' mathematical skill in Indonesia, the decline in basic mathematical competency is a serious concern. Furthermore, according to the Trends in International Mathematics and Science Study (TIMSS), a study conducted in Bengkulu examining junior high school students' mathematical problem-solving skills found that students demonstrated moderate levels of knowledge and application but low levels of reasoning (Susanta et al., 2021).

However, the reality on the ground—based on interviews with a 7th-grade mathematics teacher at a public junior high school in Kepahiang Regency—reveals that regarding the End-of-Semester Assessment, only 12.5% of the 80 students achieved the Minimum Mastery Criterion score of 70. The interviews indicated that students failed to read the questions carefully. They also struggled to solve mathematics problems that differed from the examples provided by the teacher. The teacher noted that students were accustomed to solving routine problems; consequently, most students still lacked an understanding of the concepts being taught. As a result, their solutions were often incorrect and unstructured. Most students had not yet developed an adequate understanding of the concepts being taught. Consequently, their solutions were often inappropriate and lacked a clear structure. In general, students tended to solve problems directly while overlooking the processes of understanding the problem, developing a solution plan, and reviewing or drawing conclusions from their solutions (Pardimin & Widodo, 2021).

In addition to problem-solving skill, instructional materials can serve as an alternative means of facilitating mathematics learning and making the learning process more accessible to students (Suryani et al., 2023). Ariesta and Awalludin (2021) reported that the use of student worksheets can encourage students to participate actively in problem-solving activities. Student worksheets can also provide students with more structured guidance when solving problems (Islamiah et al., 2018). Based on observations conducted by the researchers, the teacher had already incorporated student worksheets as one of the instructional materials used in the learning process. However, the student worksheets used at the school consisted primarily of a collection of essay questions and did not adequately support students in learning independently. Furthermore, the student worksheets had not incorporated Bengkulu cultural contexts. Consequently, the existing student worksheets did not adequately facilitate the development of students' mathematical problem-solving skills. Therefore, there is a need to develop student worksheets that can support students throughout the mathematical problem-solving process.

One instructional model considered effective for improving students' problem-solving skills is a learning model that can serve as a foundation for developing student worksheets. Student worksheets can be made more effective when it is designed based on an instructional model that aims to enhance students' problem-solving skills and teach them systematic approaches to solving problems (Zulfah, 2018). One such model is Problem-Based Learning (PBL), which is considered effective in improving mathematical problem-solving skills. Problem-Based Learning provides students with active learning conditions by encouraging them to solve problems collaboratively (Hapsari et al., 2022). Ariyani and Kristin (2021) reported that implementing PBL in the learning process enables students to engage actively through the processes of identifying, analyzing, and investigating problems (Ayunda et al., 2023).

Local culture is also important in education because it can motivate students and connect classroom learning with their lived experiences. Providing contexts that are relevant to students' environments can help them understand mathematical problems more meaningfully (Adha & Refianti, 2019). In the context of Bengkulu, previous research has demonstrated improvements in students' mathematical skills, including their skill to identify and interpret symbols, understand and apply mathematical concepts, conduct explorations and estimations, and derive value from their learning outcomes (Pusvita et al., 2019). By incorporating Bengkulu cultural contexts, particularly

those related to traditional foods, into problem-based student worksheets, this study is expected to help students establish stronger connections with mathematics and increase their interest in learning. Widyaningsih et al. (2023) found that students who learned through an ethnomathematics-based problem-based learning model demonstrated better problem-solving skills than those who received direct instruction.

The use of problem-based student worksheets in learning activities has also been reported to have positive effects. Previous studies support this finding. Zulfah (2018) found that problem-based student worksheets improved students' problem-solving skills. Similarly, Kurniati et al. (2018) reported that PISA-based student worksheets integrated with a Problem-Based Learning model improved students' mathematical problem-solving skills.

Based on the foregoing discussion, the researchers were motivated to investigate the differences in the effects of Bengkulu culture-integrated and non-Bengkulu culture-integrated Problem-Based Learning (PBL) student worksheets on students' mathematical problem-solving skills. Specifically, this study examines whether students who learn using Bengkulu culture-integrated PBL student worksheets demonstrate better mathematical problem-solving skills than students who learn using PBL student worksheets without Bengkulu cultural contexts. Accordingly, the researchers conducted a study entitled "A comparative analysis of Bengkulu culture-integrated and non-culture-integrated problem-based learning worksheets on mathematical problem-solving skills among junior high school students."

METHOD

This study employed a quasi-experimental research design. Quasi-experimental research is a method used to investigate the effect of a particular treatment on another variable under controlled conditions (Prasetyo et al., 2020). The study involved two experimental classes without a control class. Experimental Class 1 received instruction using Student Worksheets based on Problem-Based Learning (PBL) and integrated with Bengkulu culture, whereas Experimental Class 2 received instruction using PBL-based student worksheets without Bengkulu cultural integration. Both experimental classes were administered a post-test consisting of mathematical problem-solving skill test items.

The population of this study comprised all Grade VII students at a public junior high school in Kepahiang Regency. The sample consisted of Class 7-A, comprising 26 students, and Class 7-C, also comprising 26 students. Class 7-A was selected as Experimental Class 1 and received instruction using PBL-based student worksheets integrated with Bengkulu culture, while Class 7-C was selected as Experimental Class 2 and received instruction using PBL-based student worksheets without Bengkulu cultural integration.

The instrument used in this study was a mathematical problem-solving skill test. Data were collected using a final test (post-test). Following the administration of the test, the students' mathematical problem-solving skill test results were analyzed. The analysis was conducted to classify students' problem-solving skills based on their calculated scores. The formula used was as follows:

$$X = \frac{score\ obtained\ by\ the\ student}{maximum\ score} \times 100$$ (Mawardi et al., 2022)

Note: X = final score

According to the calculations presented, the classification criteria for students' mathematical problem-solving scores are outlined in Table 1.

Table 1. Classification of mathematical problem-solving skill test scores

Interval	Category
$80 < x \leq 100$	High
$60 < x \leq 80$	Moderate
$x \leq 60$	Low

Source: (Mawardi et al., 2022)

The data analysis consisted of descriptive statistical analysis and inferential statistical analysis. The inferential statistical analysis was conducted in two stages: (1) tests of the assumptions for statistical analysis and (2) hypothesis testing (Lestari & Yudhanegara, 2018). The Shapiro–Wilk test was used to examine the normality of the data. This test was selected because it is considered more effective and valid for small sample sizes (Quraisy, 2020). The Shapiro–Wilk formula is as follows.

$T_3 = \frac{1}{D}\left[\sum_{i=1}^{n} a_{i(X_{n-i+1}-X_i)}\right]$ with $D = \sum_{i=1}^{n}(x_{i-}\bar{x})^2$ (Cahyono, 2015)

Note:

T_3 = Shapiro-Wilk

a_i = Shapiro–Wilk test coefficient

X_{n-i+1} = The $(n-i+1)$-th data point

X_i = Mean of the data

The subsequent step involves comparing the T_3 statistic with the p-value: if T_3 exceeds the p-value, the data are considered normally distributed; if T_3 is less than the p-value, normality is not supported. The decision criteria for the normality test are as follows: if the significance value is greater than the significance level ($\alpha = 0.05$), the data are normally distributed; if the significance value is less than $\alpha = 0.05$, the data are not normally distributed. Following the normality assessment, a homogeneity test is performed. In this study, the Fisher test is applied, using the following formula.

$$F = \frac{largest\ variance}{smallest\ variance}$$ (Lestari & Yudhanegara, 2018)

The criterion for the homogeneity test was that the two sample groups were considered homogeneous if the calculated F value was less than or equal to the F-table value. Conversely, if the calculated F value exceeded the F-table value, the two sample groups were considered heterogeneous, using a significance level of 5% (Ikram et al., 2021).

$F_{table=}\ F_{(\alpha)(dk_1,dk_2)}$ (Lestari & Yudhanegara, 2018)

Note:

dk_1= degrees of freedom associated with the larger variance, $dk_1 = n_1 - 1$

dk_2= degrees of freedom associated with the smaller variance, $dk_2 = n_1 - 1$

After the prerequisite tests, namely the normality and homogeneity tests, indicated that the data were normally distributed and homogeneous, hypothesis testing was conducted. The hypotheses were formulated as follows.

$H_0: \mu_1 = \mu_2$: The mathematical problem-solving skill of students who used Bengkulu culture-integrated PBL student worksheets was equal to that of students who used PBL LKPD without Bengkulu cultural integration.

$H_0: \mu_1 > \mu_2$: The mathematical problem-solving skill of students who used Bengkulu culture-integrated PBL student worksheets was higher than that of students who used PBL student worksheets without Bengkulu cultural integration.

An independent-samples t-test was employed because the data were measured on an interval/ratio scale and the two samples were independent. The formula for the independent-samples t-test is as follows.

$$t_{calculated} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2}\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$$ (Yelvarina et al., 2018)

The hypothesis-testing criterion was that H_0 was accepted if $t_{calculated} \leq t_{table}$. Conversely, H_0 was rejected if $t_{calculated} > t_{table}$. The significance level was set at $\alpha = 5\%$, with degrees of freedom of $dk = n_1 + n_2 - 2$. For hypothesis testing using SPSS, H_0 was rejected if the significance value (Sig.) was less than α, whereas H_0 was accepted if the significance value was greater than or equal to α.

RESULTS AND DISCUSSION

Table 2 presents a summary of the results of the mathematical problem-solving skill test administered to students in Experimental Class 1 and Experimental Class 2. The results provide an overview of students' mathematical problem-solving performance following the implementation of the respective instructional treatments. The data presented in Table 2 include the relevant descriptive statistics for each experimental class and provide an initial basis for comparing students' mathematical problem-solving skills between the two groups.

Table 2. Description of mathematical problem-solving skill results

Description	Experiment 1	Experiment 2
n	26	25
Mean	75.45	68.13
Maximum score	100	96.67
Minimum score	55	51.67
Variance	178.11	150.77
Standard deviation	13.35	12.28
Skewness	0.309	0.631
Median	73.34	65

As indicated in Table 2, the mean scores for mathematical problem-solving skill varied between Experimental Class 1 and Experimental Class 2, with Experimental Class 1 achieving a higher mean. Nevertheless, the standard deviation for Experimental Class 1 exceeded that of Experimental Class 2, and the post-test mean for Experimental Class 1 rose following the intervention. These results suggest that culture-based mathematics instruction may improve mathematical problem-solving skill.

The data were subsequently analyzed using an independent-samples t-test. Prior to conducting the hypothesis test, normality and homogeneity tests were performed to determine whether the data met the assumptions required for parametric statistical analysis. The normality test was conducted to examine whether the mathematical problem-solving skill scores were normally distributed in Experimental Class 1 and Experimental Class 2. The results of the normality test are presented in Table 3.

Table 3. Results of the data normality test regarding mathematical problem-solving skill

Data	Shapiro Wilk		Note
	Significance level	Significance	
Experimental class 1	0.242	0.05	Normally distributed
Experimental class 2	0.137	0.05	Normally distributed

Based on the results presented in Table 3, the Shapiro–Wilk normality test showed that the post-test scores for Experimental Class 1 had a significance value of 0.242, which was greater than 0.05, whereas the post-test scores for Experimental Class 2 had a significance value of 0.137, which was also greater than 0.05. Therefore, the null hypothesis (H_0) was not rejected, indicating that the post-test scores for both Experimental Class 1 and Experimental Class 2 were normally distributed.

Following verification of the normality assumption, a Fisher test was performed to assess homogeneity of variances between the two experimental groups. The results of this analysis are reported in Table 4.

Table 4. Fisher's test results for problem-solving skill

$F_{calculated}$	F_{table}	Note
1.181	1.975	Homogeneous

As shown in Table 4, the homogeneity test yielded a calculated F-value of 1.181, which was lower than the critical F-value of 1.975. Therefore, the null hypothesis (H_0) was not rejected, indicating that the variances of the two experimental groups were homogeneous. Thus, based on the Fisher test, the post-test data from Experimental Class 1 and Experimental Class 2 satisfied the assumption of homogeneity of variance.

Having confirmed that the data were normally distributed and homogeneous, the hypothesis was tested using an independent-samples t-test. The hypothesis testing was conducted using Microsoft Excel and IBM SPSS Statistics version 25. The results of the independent-samples t-test calculated using Microsoft Excel are presented in Table 5.

Table 5. Post-test t-test results

$t_{calculated}$	t_{table}	Note
2.034	2.009	H_0 is rejected

As shown in Table 5, the independent-samples t-test performed in Microsoft Excel produced a calculated t-value of 2.034 and a critical t-value of 2.009. Because the calculated t-value exceeded the critical value, the null hypothesis (H_0) was rejected in favor of the alternative hypothesis (H_1). These findings suggest a statistically significant difference in mathematical problem-solving performance between the two experimental groups.

As an alternative method for assessing the statistical significance of the hypothesis test, the data were analyzed using IBM SPSS Statistics version 25. The decision rule was established as follows: the null hypothesis (H_0) was rejected when the significance value (Sig.) was less than $\alpha = 0.05$. Conversely, the null hypothesis (H_0) was not rejected when the p-value was greater than or equal to the specified significance level. $\alpha = 0.05$. The results of the hypothesis test, generated via SPSS, are presented in Table 6.

Table 6. Post-test t-test results generated via SPSS

Significance	Significance level (α)	Note
0.047	0.05	H_0 is rejected

As indicated in Table 6, the independent-samples t-test yielded a two-tailed significance value of 0.047, which was below the established significance level of $\alpha = 0.05$. The null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was supported, indicating a statistically significant difference in mathematical problem-solving performance between the two experimental groups. Analysis conducted using Microsoft Excel and IBM SPSS Statistics version 25 consistently demonstrated that students utilizing Student Worksheets based on Problem-Based Learning (PBL) integrated with Bengkulu cultural content achieved higher mathematical problem-solving scores than those using PBL-based worksheets without cultural integration. These results suggest that incorporating Bengkulu cultural contexts into PBL materials may enhance the learning environment for developing students' mathematical problem-solving skills.

The findings of this study indicate that students who learned using Student Worksheets based on Problem-Based Learning (PBL) and integrated with Bengkulu culture demonstrated significantly higher mathematical problem-solving skills than those who learned using PBL-based student worksheets without Bengkulu cultural integration. This conclusion is supported by the results of the independent-samples t-test. The calculated t-value was 2.034, exceeding the critical t-value of 2.009. Consistently, the SPSS analysis yielded a two-tailed significance value of 0.047, which was lower than the significance level of $\alpha = 0.05$. These results provide statistical evidence

that the two instructional treatments produced significantly different outcomes in students' mathematical problem-solving skills.

The difference was also reflected in the descriptive statistics. Students in Experimental Class 1, who received instruction using Bengkulu culture-integrated PBL-based LKPD, obtained a mean post-test score of 75.45, whereas students in Experimental Class 2, who used PBL-based student worksheets without Bengkulu cultural integration, obtained a mean score of 68.13. Thus, the mean score of Experimental Class 1 was 7.32 points higher than that of Experimental Class 2. This finding suggests that integrating Bengkulu cultural contexts into PBL-based student worksheets may provide additional support for students in developing mathematical problem-solving skills.

The higher performance observed in the Bengkulu culture-integrated group can be understood from the role of contextual and culturally meaningful situations in mathematics learning. By incorporating familiar cultural contexts, particularly those related to students' everyday experiences, mathematical problems can become more meaningful and accessible. Such contexts may help students establish connections between mathematical concepts and real-life situations, thereby supporting the processes of understanding problems, identifying relevant information, developing solution strategies, and interpreting solutions. When these contextual situations are combined with the problem-solving stages of PBL, students are provided with opportunities to engage actively in identifying, analyzing, and solving problems rather than merely applying procedures demonstrated by the teacher.

These findings are consistent with previous research demonstrating the potential of ethnomathematics-based learning to strengthen students' mathematical problem-solving skills. Purwanti et al. (2019), for example, reported that students who participated in an ethnomathematics-based Problem-Based Learning model demonstrated better mathematical problem-solving skills than students who participated in Problem-Based Learning without an ethnomathematics component. The present findings extend this evidence by indicating that the integration of Bengkulu cultural contexts into PBL-based student worksheets can be a promising approach for supporting students' mathematical problem-solving development. Therefore, culturally contextualized instructional materials may not only enhance the relevance of mathematics learning but also provide students with meaningful situations through which mathematical problem-solving processes can be developed.

The following are the results of the mathematical problem solving skill test for students in class 7-A and 7-C based on the mathematical problem solving indicators as in Figure 1.

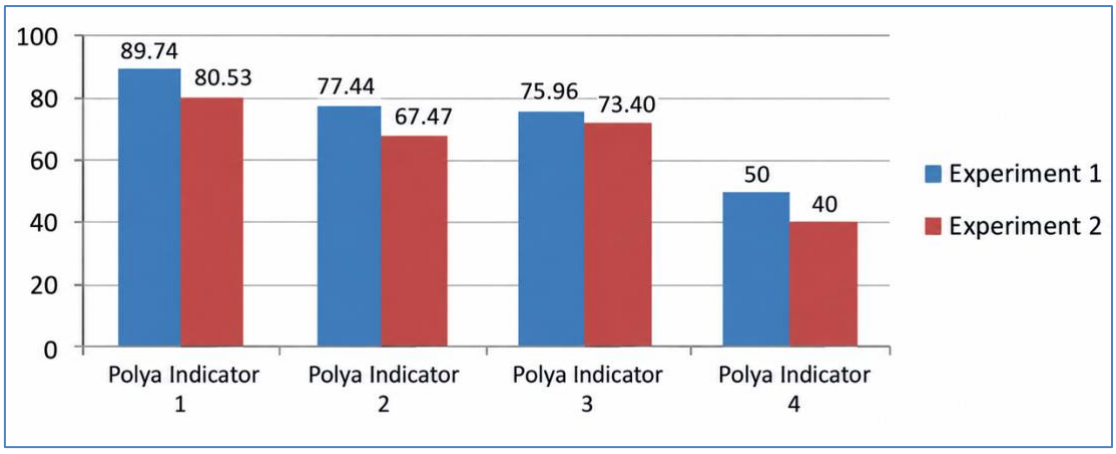

Figure 1. Diagram of average mathematical problem-solving skill scores by indicator

As shown in Figure 1, students' mathematical problem-solving skill on the problem-understanding indicator differed between the two experimental classes. The mean score for Experimental Class 1 was 89.74, which was higher than that of Experimental Class 2, at 80.53. These mean scores indicate that students in both experimental classes were generally able to understand the problems appropriately. However, some students were able to identify the given

information or what was being asked but did so incompletely, while others did not explicitly state either component. This finding is consistent with Zahrah and Setiani (2023), who reported that students made errors when identifying the information given and the questions asked in mathematical problems.

For Indicator 2, planning the solution, students in Experimental Class 1 obtained a mean score of 77.44, compared with 67.47 for Experimental Class 2. This result indicates that students in Experimental Class 1 performed better in planning their solutions. This difference may be attributed to the fact that a greater proportion of students in Experimental Class 1 were able to formulate appropriate strategies for solving the given problems. In contrast, several students in Experimental Class 2 experienced difficulties in determining appropriate solution plans. This finding is consistent with Sulistiowati (2022), who reported that many students experienced difficulties in solving mathematical problems because they had difficulty applying appropriate strategies.

For Indicator 3, carrying out the solution, the mean score for Experimental Class 1 was 75.96, compared with 73.40 for Experimental Class 2. Although the difference between the two classes was relatively small, Experimental Class 1 still achieved a higher mean score. The results indicate that many students in both classes were able to carry out the planned solution appropriately, as reflected in the relatively high number of students who obtained the maximum score of 4 for this indicator.

For Indicator 4, checking the solution, Experimental Class 1 obtained a mean score of 50.00, whereas Experimental Class 2 obtained a mean score of 40.00. Although Experimental Class 1 performed better, this indicator represented the lowest level of performance in both groups. In particular, many students in Experimental Class 2 did not provide a conclusion or explicitly review the steps they had taken to solve the problem. This finding is consistent with Yuniarti et al. (2020), who found that students often did not re-examine their solutions because they were confident in their answers or were not accustomed to checking their work after solving mathematical problems.

Overall, the analysis across the four indicators shows that the mean mathematical problem-solving skill scores of students in Experimental Class 1 were consistently higher than those of students in Experimental Class 2. Thus, students who learned using PBL-based student worksheets integrated with Bengkulu culture demonstrated better mathematical problem-solving performance than those who learned using PBL-based student worksheets without Bengkulu cultural integration.

The superior performance of Experimental Class 1 may be attributed to students' greater engagement in the learning process. During the learning activities, students were actively involved in discovering and understanding the formulas needed to solve problems, discussing solution strategies with their peers, and presenting the results of their group discussions to the class. The implementation of Bengkulu culture-integrated PBL-based student worksheets also created a more engaging learning environment because the teacher incorporated local cultural contexts as learning resources when presenting mathematical concepts. This approach enabled students to connect mathematical content with familiar cultural contexts and provided meaningful situations for mathematical problem solving. This finding is consistent with Kembaren and Nuryadi (2024), who found that ethnomathematics-based student worksheets could increase students' engagement in mathematics learning by connecting mathematical content with cultural contexts.

Students in Experimental Class 1 also demonstrated a high level of interest in the student worksheets and actively participated in group discussions to solve problems related to Bengkulu culture. Their active participation appeared to contribute to greater engagement throughout the learning process. This finding is supported by Shabira and Ella (2023), who reported that ethnomathematics-based student worksheets were effective in improving students' mathematical problem-solving skills while also encouraging greater participation in the learning process.

In contrast, students in Experimental Class 2 used PBL-based student worksheets without Bengkulu cultural integration. During the learning process, students exchanged information within their groups and sought guidance from the teacher through questions and discussions when they

encountered difficulties in solving problems. However, group collaboration was relatively limited. Only a small number of students tended to be actively involved and dominate the group discussions, while other students participated less actively. As a result, some problems assigned by the teacher were solved individually rather than collaboratively. This limited interaction may have reduced opportunities for students to exchange ideas and construct knowledge collectively, which may have contributed to the lower mathematical problem-solving test scores observed in Experimental Class 2 compared with Experimental Class 1.

The post-test results also revealed that some students continued to experience difficulties in following the complete stages of mathematical problem solving. Several students did not explicitly identify the information given and the questions asked, formulate a solution plan or mathematical model, or provide a conclusion after completing the solution, even though these steps had been emphasized during the learning activities using the student worksheets. An interview with one of the students indicated that, during regular mathematics instruction, students were not consistently accustomed to following systematic problem-solving stages, such as identifying known and unknown information, developing a solution plan, performing calculations, and drawing conclusions. Consequently, some students continued to omit or incorrectly perform certain stages when completing the post-test. This finding is consistent with Pardimin and Widodo (2021), who reported that students tend to proceed directly to solving mathematical problems while sometimes neglecting the stages of understanding the problem, planning the solution, and reviewing or concluding the solution.

The findings further show that the two types of PBL-based student worksheets produced different mean scores in students' mathematical problem-solving skills. Before participating in learning activities using Bengkulu culture-integrated PBL-based student worksheets, many students had limited familiarity with Bengkulu's local culture, and some were unfamiliar with traditional Bengkulu foods that carry cultural significance. The integration of ethnomathematical contexts into mathematics learning may therefore provide an opportunity for students to become more familiar with and appreciate their local cultural heritage while simultaneously understanding the relevance of mathematics in everyday life. As reported by Geni et al. (2017), ethnomathematics-based learning can foster students' appreciation of local culture while helping them understand mathematics through its applications in everyday contexts.

Furthermore, Kaselin et al. (2013) demonstrated that learning materials connecting real-life problems with cultural contexts in students' surrounding environments can support students in generating mathematical ideas. This perspective is also supported by Geni et al. (2017), who found that problem-based learning incorporating ethnomathematical contexts improved students' mathematical problem-solving skills. Taken together, these findings suggest that the integration of culturally meaningful contexts into PBL-based instructional materials can provide students with more relevant and meaningful problem situations, thereby supporting the development of mathematical problem-solving skills.

CONCLUSIONS

Based on the findings of the study, it can be concluded that students who learned using Student Worksheets based on Problem-Based Learning (PBL) and integrated with Bengkulu culture demonstrated significantly higher mathematical problem-solving abilities than students who learned using PBL-based student worksheets without Bengkulu cultural integration. This difference was evidenced by both the descriptive and inferential results. The mean post-test score of students in Experimental Class 1, which used Bengkulu culture-integrated PBL-based student worksheets, was 75.45, whereas the mean score of students in Experimental Class 2, which used PBL-based student worksheets without Bengkulu cultural integration, was 68.13. Thus, the Bengkulu culture-integrated group achieved a 7.32-point higher mean score.

The inferential analysis further confirmed that the difference between the two experimental groups was statistically significant. The independent-samples t-test yielded a significance value of 0.047, which was lower than the significance level of $\alpha = 0.05$. Therefore, H_0 was rejected and H_1

was supported, indicating a significant difference in students' mathematical problem-solving abilities between the two groups. This finding was also supported by the comparison between the calculated and critical t-values, in which the calculated t-value of 2.034 was greater than the critical t-value of 2.009. Taken together, these results provide empirical evidence that the integration of Bengkulu cultural contexts into PBL-based student worksheets was associated with better mathematical problem-solving performance than the use of PBL-based student worksheets without such cultural integration.

The findings suggest that incorporating culturally meaningful contexts into PBL-based instructional materials can provide students with more familiar and relevant problem situations, potentially facilitating their engagement in understanding problems, planning solution strategies, carrying out mathematical procedures, and interpreting or reviewing their solutions. In this regard, Bengkulu culture-integrated PBL-based student worksheets represents a promising instructional approach for supporting the development of students' mathematical problem-solving abilities while simultaneously connecting mathematics learning with local cultural contexts. Nevertheless, further research involving larger and more diverse samples, as well as longer implementation periods, is needed to examine the consistency and generalizability of these findings across different educational contexts.

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