Effectiveness of Lipa’ Sa’be Mandar on the Mathematical Representation Ability of Students of SMK Mega Link Majene

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Abstract. This research is an experimental study that aims to see the effectiveness of instructional media based on Mandar culture, in this case, lipa’ sa’be Mandar. The instrument used in this study was a test to measure the ability of mathematical representations, student activity observation sheets, and student responses to learning. The subjects of this study were 30 students of class X TKJ SMK Mega Link Majene. The data analysis used is descriptive and inferential statistical analysis. The analysis results showed that the average value of the students' mathematical representation ability was 90.97 in the medium category. Student activities are in the very active category, namely 80%, and student responses to learning give a very positive response of 80%. The t-test shows the value of sig. (2-tailed) = 0.000 < α = 0.05, thus the application of lipa’ sa’be Mandar learning media is effective on students' mathematical representation abilities.

1. Introduction
School mathematics and culture are closely related to the life of the Mandar community. The mathematic can see from the patterns or motifs in the traditional Mandar sarong called lipa’ sa’be Mandar. Lipa’ sa’be Mandar, when viewed from a mathematical point of view, it will draw a pattern of a line from left to right that has specific characteristics. Underlies the use of the traditional lipa’ sa’be Mandar sarong, which represents mathematical concepts, especially in the line and series material for SMK Mega Link Majene. The mathematical representation ability using lipa’ sa’be Mandar has several indicators, namely presenting information from lipa’ sa’be Mandar, creating mathematical models, and number patterns from the information from lipa’ sa’be Mandar, and carrying out completion steps. [1] explained in his research that representation is an interpretation of students' thoughts on a problem. The form of student interpretation can be words or verbal, written, pictures, tables, graphics, concrete objects, and mathematical symbols.

Mathematical representations are visible or tangible productions such as diagrams, number lines, graphs, arrangements of concrete objects or manipulatives, physical models, written words, mathematical expressions, formulas, and equations [2]. The mathematical representation aims to reveal, describe, and analyze a problem to find a solution. Therefore, in learning mathematics, students' ability to represent mathematical representation in solving mathematical problems is needed because, through representation, students can communicate an idea with the problem at hand [3,4]. Studies about the importance of mathematical representation in problem-solving were carried...
out by [5]. Research on the application of lipa' sa'be Mandar to students' mathematical representation abilities presented in Figure 1.

**Figure 1.** Application of lipa' sa'be mandar in mathematics learning.

*Lipa' sa'be* Mandar (sarong of mandar silk) is a silk sarong made from woven mandar women (the loom is known as panette). Ethnomathematics in mathematics learning are one solution [6-8], and learning innovations uphold local cultural values. Mathematics is born from the activities of a cultural environment, therefore utilizing culture in learning mathematics can be an option [9-13]. In Indonesia, Ethnomathematics is not something new. There have been several studies that explore and then produce findings about the concept of Mathematics in culture. In traditional houses, woven fabrics, batik motifs, traditional games, and so on.

The usage of learning media can increase students' interest in learning mathematics, students not only listen to teacher descriptions, but students also demonstrate and act out learning activities and can improve student mathematics learning outcomes [14-17]. Learning mathematics is easier for students to understand by using learning media or teaching aids in the learning process. The most important thing in the application of learning media is that it contains aspects of joy, pleasure, and away from tension when learning. Besides this, the use of mathematics learning media can also increase students' independence in learning because its use is not limited to the classroom [18]. This study aimed to determine the effectiveness of the lipa' sa'be Mandar on students' mathematical representation abilities, especially in the sequence and series material.

### 2. Methods

This research is quasi-experimental research aiming to determine the effectiveness of the lipa sa'be Mandar learning media on students' mathematical representation abilities. The research design used was One-Group-Pretest-Posttest. In this study, no control group used. This design only compares the results of the pretest (O1) and post-test (O2) after the application of the learning media of lipa' sa'be Mandar (X) in class X SMK Mega Link Majene.

There are three instruments used in this study, namely

1. tests to measure the ability of mathematical representations consisting of pretest and post-test,
2. observation sheets to observe student activities during the learning process using lipa' sa'be Mandar media, and
3. questionnaire of student responses to learning using lipa' sa'be Mandar.

Data analysis are using descriptive statistics and inferential statistics. Descriptive statistical analysis is used to describe students' mathematical representation abilities. While inferential statistics test the research hypothesis, students' mathematical representation ability of SMK Mega Link Majene is different before and after applying mathematics learning using lipa' sa'be Mandar.

Indicators of the effectiveness of the lipa sa'be Mandar learning media on students' mathematical representation abilities are:
1) Meet the KKM score classically eighty percent with the individual KKM score equal to seventy. The individual completeness categories and classical completeness are presented in Table 1 and Table 2.

| Table 1. Individual completeness categories. |
|---------------------------------------------|
| Value       | Category  |
| 0 ≤ value < 70 | Incomplete |
| 70 ≤ value ≤ 100 | Complete |

| Table 2. Classical completeness categories (CC). |
|-----------------------------------------------|
| Classical Completeness (%) | Category |
| 0 ≤ CC < 80 | Not fulfilled |
| 80 ≤ CC ≤ 100 | Fulfilled |

2) Fulfill at least > 50% of student activities in the "active" category. The categories of student activity during the learning process presented in Table 3.

| Table 3. Student activity categories (AS). |
|-------------------------------------------|
| Student Activity (%) | Category |
| 75 < AS ≤ 100 | Very active |
| 50 < AS ≤ 75 | Active |
| 25 < AS ≤ 50 | Sufficiently active |
| 0 < AS ≤ 25 | Not active |

3) Meet at least > 50% of students positively respond to learning after applying lipa’ sa’be in mathematics learning. The categories student of responses presented in Table 4.

| Table 4. Student response categories (RS). |
|--------------------------------------------|
| Student Response (%) | Category |
| 75 < RS ≤ 100 | Very positive |
| 50 < RS ≤ 75 | Positive |
| 25 < RS ≤ 50 | Negative |
| 0 < RS ≤ 25 | Very negative |

4) There is a difference before and after applying the Mandar lipa' sa'be used or with \( \alpha > \text{sig} \).

**3. Results and Discussion**

This research conduct for four meetings. Meeting 1 to collect pretest data. The second and third meeting is giving treatment, namely applying to learn using lipa’ sa’be Mandar to develop students’ mathematical representation skills. The fourth meeting was post-test data collection. At the second and third meetings, namely carrying out the absorption of learning lipa’ sa’be Mandar on the line and series material, pray one example of the problem is as follows:

a. Problem for arithmetic sequence and series material:

There are beads in the sure‘ lipa’ sa’be Mandar box, with a pattern of the number of beads: 2, 5, 8, 11, 14, ... Determine the number of beads in the sure‘ to- box 6, 8th and 15th lipa’ sa’be Mandar.

Students grouped to discuss and complete these questions by taking the Mandar lipa’ sa’be and beads that have been prepared by the teacher. The following is figure 2 of the student discussion process.
b. The problem for geometric sequence and series material:
If you want a piece of *lipa’ sa’be* Mandar was decorated by adding beads to the *sure’* Mandar box with the rules: The first sure box is placed one bead, in the second sure box two beads are placed, and in the third sure box put four pieces of beads. And so on until the nth box. Count the number of beads in sure '6th box.

Students grouped to discuss and complete these questions by taking the *lipa’ sa’be* Mandar and beads that have been prepared by the teacher. The following is figure 3 of the student discussion process.

![Figure 3](image)

Figure 3. Discussion on the completion of arithmetic sequences and series problems.

The data collection pretest and post-test results saw in Table 5 of the analysis of students' mathematical representation ability tests. Based on table 5 the average pretest and posttest learning outcomes have increased, this shows that there is a change in learning outcomes after using the *lipa’ sa’be* Mandar learning media. This finding is in line with previous research conducted by which stated that learning mathematics with a local wisdom approach was able to improve students' learning achievement.

The results of the student activity analysis showed that 80% categorized as very active. This finding is in line with [13] which states that the application of ethnomathematics increases students' interest and motivation in learning mathematics. While the results of the student response questionnaire analysis obtained, 85% gave very positive responses. This is in line with the findings
[16] that applying local wisdom mathematics learning media gives a positive response and improves students' skills.

**Table 5.** Descriptive statistical analysis of mathematical representation ability test data.

| Statistics                        | Pretest | Posttest |
|-----------------------------------|---------|----------|
| Mean                              | 64.47   | 90.97    |
| Mode                              | 69      | 94       |
| Standard deviation                | 4.53    | 3.11     |
| Variants                          | 20.53   | 9.69     |
| Maximum value                     | 71      | 96       |
| Minimum value                     | 55      | 85       |
| The percentage of classical       | 27%     | 100%     |
| completeness                      |         |          |

Inferential statistical analysis for normality test obtained data presented in Table 6.

**Table 6.** Analysis of data normality test.

| Postes | Kolomogorov-Smirnov | Shiporo-Wilk |
|--------|---------------------|--------------|
|        | Statistic | Df | Sig. | Statistic | Df | Sig. |
|        | 0.110      | 30 | 200* | 0.953      | 30 | 0.207 |

From the analysis results, the sig value obtained = 0.207 > α = 0.05. it means that the data distributed normally. The statistical hypothesis test analysis results using the t-test can see in table 6 below.

**Table 7.** Analysis of the t-test

| Postes | Tes value = 75 | Mean Difference | 95% Confidence of Difference | Lower | Upper |
|--------|----------------|-----------------|-----------------------------|-------|-------|
|        | T             | df             | Sig. (2-tailed)             |       |       |
|        | 28,096        | 29             | 0.000                       | 15,967| 14,80 | 17,13 |

From the analysis result, the sig value obtained (2-tailed) = 0.000 < α = 0.05, meaning that there are differences in the students' mathematical representation abilities before and after the application of *lipa*’*sa’be* Mandar is applied.

Based on the research results, it found that the application of *lipa*’*sa’be* mathematics learning was effective against the ability of students' mathematical representation. This finding is in line with [18] the application of the culture of an area can develop in school mathematics learning to improve the quality of mathematics learning in schools.

4. Conclusion

*Lipa*’*sa’be* Mandar is an alternative that can use as a medium for school mathematics learning. *Lipa*’*sa’be* Mandar is effective on the ability of mathematical representation, especially in the material of sequences and series.

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