

LEARNING MATHEMATICS CONGRUENCE AND SIMILARITY: AN ANALYSIS OF STUDENT RESPONSE TO THE EXPLORATION OF A TRADITIONAL BOAT OF BUGIS SPECIFIC PHINISI

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ABSTRACT

To succeed in the competitive period, one must be able to complex problems solving, which requires the ability to recognize problems, analyze their details, and come up with answers. However, students continue to struggle greatly with addressing complex problems. The exploration of the traditional Bugis phinisi boat and its relationship to complex problem-solving skills in congruence and similarity mathematics learning is one method for developing students' ability to complex problems solving. This method is one alternative for improving students' ability to complex problems solving. This study, which falls under the category of quantitative descriptive research, examines how students react to the use of phinisi boat exploration in the teaching of mathematics. Thirty students from class IX C of SMP Negeri 1 Kahu participated in the study as respondents. The tool used to determine the preferences of the students for the learning activities is a questionnaire. The findings demonstrated that students preferred studying the traditional Bugis phinisi boat in congruence and similarity mathematics, with 94.15% of students rating their ability to solve hard problems in the very good category.

Keywords: complex problem solving; phinisi boat; congruence and similarity

1. Introduction

One of the skills that will further develop in the next five years according to the Future of Jobs Report in the World Economics Forum (2020) is Complex Problem Solving (CPS). CPS is an activity to identify complex problems, evaluate, review factual information and build rational interpretations for the formation of effective solutions (Asfar *et al.*, 2021; Liu & Jiang, 2021). This skill has become one of the important skills as an indicator of academic achievement, so it needs to be honed to compete in the competitive era (Nicolay *et al.*, 2021; Bertel *et al.*, 2021). However, until now CPS skills are still very low for students.

The low CPS skills of students can be seen from the results of the 2018 PISA study which showed Indonesia's score was only 379 with a

ranking of 67 out of 74 countries (OECD, 2019; Asfar *et al.*, 2021; Nurannisa *et al.*, 2021). This result is a benchmark for students' CPS skills because the questions are based on higher-order thinking skills (Nusantara *et al.*, 2021), while CPS is already in the ranks of higher-order thinking skills (Rozi *et al.*, 2021). One of the subjects that need CPS skills in mathematics, especially geometry. This is because the material is abstract and requires visualization, so students need to understand in-depth the existing questions and conduct analysis by identifying complex problems (Pedaste *et al.*, 2019; Nurannisa *et al.*, 2021; Nurannisa *et al.*, 2022).

Based on the results of the 2019 National Examination, mathematics obtained the lowest score among other subjects, which was 39.33, which was below the standard passing criteria of

55 (scale 0-100). This was also found in students in Bone Regency who only got a UN score of 34.25 in the less category (Asfar *et al.*, 2021). One of the materials that hinder student achievement is geometry material with a score of 29.57 (Puspendik, 2020). Geometry is a field of mathematics that focuses on studying points, lines, planes, and spaces, as well as relating to abstract concepts or symbols formed from inductively defined elements (Amalliyah, Dewi & Dwijanto, 2021; Asfar *et al.*, 2022), such as the subject of congruence and similarity.

One of the factors causing the low CPS skills of students in understanding congruence and similarity material is a more rote learning process, where the teacher in applying the model only focuses on the formulations in the textbook, so that when students encounter a variety of questions that are different from the previous example. will experience confusion in solving it. This visualization material does not only require memorizing formulas in solving problems, but it is very necessary to understand the meaning of the two material concepts (Shalikhah *et al.*, 2021; Asfar *et al.*, 2021; Nurannisa *et al.*, 2020). To make it easier for students to understand the concepts of congruence and similarity, the appropriate learning given is learning based on local wisdom.

Local wisdom is a heritage that is rich in value, experience, and knowledge accumulation, and can be implemented in education to bridge traditional and contemporary knowledge (Asmar & Suryadarma, 2021; Magfirah *et al.*, 2022; Nurannisa *et al.*, 2021; Nurlia *et al.*, 2022). However, the limited understanding of teachers and the belief that the concepts learned in culture are different from current concepts have resulted in local wisdom not being integrated into learning. In fact, mathematics based on local wisdom (ethnomathematics) can allow students to understand concepts by linking culture or experience in learning (Asfar, Asfar & Nurannisa, 2021; Sumiati *et al.*, 2022; Rismawati *et al.*, 2021). The application of local wisdom-based learning requires media that can involve students' experiences in the learning process, such as the local wisdom of the phinisi boat.

The phinisi boat is one of the local wisdom of the Bugis tribe with a unique shape (Mahmuddin *et al.*, 2015; Jamala *et al.*, 2020). The mathematical content of the phinisi boat can be seen from the pattern of the part of the boat (a sail) which can be integrated with congruence and similar materials. This is because the phinisi boat has parted with almost the same shape even though the size is different. To determine the size of the

pattern of the boat section, we can use the concepts of congruence and similarity by identifying complex problems in forming the right solution. Therefore, this study aims to analyze students' responses to the exploration of a traditional Bugis phinisi boat congruence and similar mathematics learning.

2. Research Methods

This research is a quantitative descriptive study that aims to describe and analyze students' responses to the exploration of the traditional Bugis phinisi boat congruence and similar mathematics learning. Research respondents were 30 students of class IX C SMP Negeri 1 Kahu. The data collection technique used is a questionnaire (questionnaire). The questionnaire is a set of written statements given as a form of description of the research that has been carried out to determine student responses to the learning process that has been applied. The percentage of student responses can be calculated using the formula below (Ariyawati, Waluyo & Prihatin, 2017).

$$\text{Response Percentage} = \frac{\text{Total Score}}{\text{Maximum Score}} \times 100$$

The results of the percentage of student responses are converted into quantitative data with the following criteria.

Table 1. Student Response Criteria

Percentage (%)	Category
$81,25 < x < 100$	Very Good
$62,5 < x < 81,25$	Good
$43,75 < x < 62,5$	Not Good

(Source: Saputra, 2019)

3. Results and Discussion

This research was conducted to determine the students' responses to the exploration of the traditional Bugis phinisi boat congruence and similar mathematics learning. To find out student responses, in this case, a questionnaire containing statements related to the learning process was used. Student response questionnaires were given after the learning process was carried out by applying the traditional Bugis phinisi boat exploration. Student response data can be seen in the following table.

Table 2. Student Response Data

No	Rated aspect	Average Score
Management		
1	Student study preparation	4
2	Bringing together the ideas obtained from the identification	3,9

No	Rated aspect	Average Score
3	Check and plan problem-solving solutions	3,8
Activity		
4	Express and respect the opinions of others	4
5	Student interest becomes more active in learning	5
6	Student activity in the learning process	6
Knowledge		
7	Understanding the problem and its relation to the material	3,8
8	Understand and relate the interrelationships of existing facts	3,7
9	Understanding and respecting the decisions of others	3,6
Effectiveness		
10	Group learning	3,6
11	Making decisions as a solution to problems	3,7
12	Feeling happy students in learning	3,6

The results of the data analysis of student responses to the exploration of the traditional Bugis phinisi boat can be seen in Figure 1.

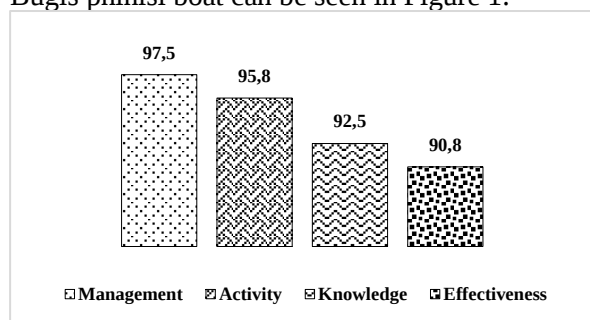


Figure 1. Result of Student Response Data Analysis

The results of the data analysis of the student's responses to the exploration of the Bugis traditional phinisi boat in congruence and similar mathematics learning show the overall average percentage is in the very good category. This shows that the exploration of the traditional Bugis phinisi boat in congruence and similar mathematics learning has received a positive response from students. The questionnaire used in the research on the exploration of traditional Bugis phinisi boats in congruence and similar mathematics learning refers to four indicators, namely management, activity, knowledge, and effectiveness. The results of student responses show that from the four indicators the percentage is $81.25 < x < 100$.

Exploration of the traditional Bugis phinisi boat in congruence and similarity mathematics learning consists of three stages of learning, namely the design, collaboration, and demonstration stages. The first indicator (management) at the design stage shows students' responses to the exploration of the traditional Bugis phinisi boat in congruence and similar mathematics learning, namely in general students have a positive response with a mean score of 3.9. Student responses to learning were positive because most students were interested, serious, and motivated to learn mathematics by exploring the traditional Bugis phinisi boat. Learning like this is a new thing for students so that a series of activities in the learning process make students interested and motivated in learning. This is in line with the research of Sujiwo & A'yun (2020), where student learning motivation is strongly influenced by the uniqueness of learning. A unique and interesting learning process will indirectly increase the attractiveness of students to be enthusiastic and serious about participating in learning. In addition, the collaboration stage in the application of traditional Bugis phinisi boat exploration in congruence and similar mathematics learning emphasizes the ability of students to solve problems in groups (discussion). Through this collaborative process, students are given a series of questions that are more complex in nature to be solved with logical and structured thinking, so that students feel challenged to take learning seriously. Sukarta (2019) in his research states that giving structured assignments can improve students' understanding and memory by constructing their knowledge in solving complex problems. Zainal (2018) adds that the average student learning outcome by giving structured assignments at the collaboration stage is 81.56 which is included in the high category. This supports learning carried out by exploring traditional Bugis phinisi boats, which can increase students' knowledge, especially in solving complex problems. Student responses to this knowledge indicator reached an average score of 92.5.

In addition to increasing student knowledge, the collaboration stage in the exploration of the traditional Bugis phinisi boat in mathematics learning congruence and similarity can activate students in the mathematics learning process with an average student response score of 95.8. These results indicate that students agree that learning makes it easier for them to interact more

by way of discussion between students and teachers, making them ask more questions and share knowledge. In line with the research of Nurdiana & Haryanto (2019), where students' confidence in expressing their ideas, opinions, and input on a problem can be increased through learning by sharing knowledge in discussions. The exploration of the traditional Bugis phinisi boat in this study also showed positive results on the effectiveness indicator, namely the average score of 90.5. The effectiveness of traditional Bugis phinisi boat exploration in learning mathematics, congruence, and similarity can also be seen in the results of student demonstrations independently which show a significant increase. The demonstration stage is a presentation stage or demonstrating the results of the collaboration to see the extent to which students understand the collaborative learning process that has been implemented. The increase in student learning outcomes is seen in the average test score which increases from the results of the pretest and post-test. These results can be seen in Figure 2.

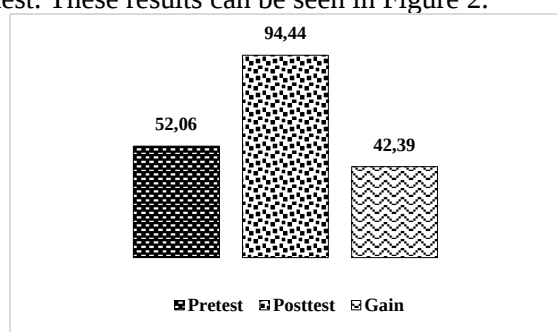


Figure 2. Improved Student Learning Outcomes

Figure 2 shows a significant increase in student learning outcomes from the pretest of 52.06, which increased to 94.44 in the posttest. The increase that occurs from the results of the pretest to the posttest can be seen in the gain of 42.39. Gain is the difference between the post-test and pretest scores which shows an increase in students' complex problem-solving abilities after the traditional Bugis phinisi boat exploration is applied in the learning process to avoid the results of research biased conclusions. This shows that the exploration of the traditional Bugis phinisi boat has a positive impact on learning mathematics.

The demonstration stage in the exploration of the traditional Bugis phinisi boat greatly affects students' memory of a lesson, where students can mention the lessons they have learned through a review of each subject matter so that students' understanding can last a long time (Chyl *et al.*, 2021). This is not much different from the results

of the study by Sumartini (2017), where students get maximum results at the demonstration stage because they have able to conclude the final results of the questions given, and be able to summarize the concepts of the material studied, write down activities that have been carried out during the learning process and write suggestions for evaluation materials for further learning.

Based on the explanation above, it can be seen that the congruence and similarity of mathematics learning through the exploration of the traditional Bugis phinisi boat has a positive impact on students as seen from the results of the analysis of student responses to the learning carried out. In terms of learning management, the average student response score is 3.9 with a percentage of 97.5%. In terms of activity, the average student response score is 3.8 with a percentage of 95.8%. The student response in terms of knowledge obtained an average score of 3.7 or 92.7%, while the effectiveness of traditional Bugis phinisi boat exploration in congruence and similar mathematics learning obtained an average student response score of 3.6 or 90.8%. Therefore, the exploration of the traditional Bugis phinisi boat can be applied in learning mathematics of congruence and similarity.

4. Conclusions

Exploration of the traditional Bugis phinisi boat in congruence and similar mathematics learning received a positive response from students with a mean score of 3.75 or 94.15%. This can be seen from student responses based on four indicators, namely management, activity, knowledge, and effectiveness. Through a series of learning activities (design, collaboration, and demonstration stages) on the exploration of a traditional Bugis phinisi boat, students feel interested and motivated and are more confident in learning mathematics, especially on congruence and similarity materials. Therefore, the exploration of the traditional Bugis phinisi boat can be an alternative solution to improving students' complex problem-solving abilities congruence and similar mathematics learning.

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