Differences In Mathematical Understanding Concepts Of Urban, Suburban, And Rural Students

Anny Sovia, Tatang Herman, Jarnawi Afgani

Abstract: This writing discusses how to understand the concepts of students in urban, suburban, and rural schools on material of fraction. This research is a descriptive study with qualitative research. Data were collected by giving eight questions of understanding concepts to students, and answers were grouped, looked for average scores and presentations then analyzed by giving a code on each student's answer to see the difference in understanding of the concept. The results showed that urban students have a good understanding of the concept of fraction material shown by always providing a logical rationalization in each answer; suburban students are classified as moderate, the students are able to understand concepts but are still mistaken in some questions in operating fractions; and rural are classified as low, the answers given tend to be careless indicating that students do not understand the concept. By looking at differences in the ability of understanding concepts, it can be used as an evaluation material for teachers to improve the quality of teaching and as an input for the government to seek equitable education.

Index Terms: Differences, fraction, mathematical understanding concept.

1. INTRODUCTION
Learning with understanding is an important goal in every subject, including mathematics. Learning, mathematical understanding is the basis for thinking in solving mathematical problems and problems in daily life [1], [2], [3]. Understanding of mathematical concepts enables students to understand the essence of teaching and the material learned [4]. According to Bloom, in the cognitive domain there are six levels, namely knowledge / memorization / memory, understanding, application, analysis, synthesis, and evaluation. Understanding is the ability of someone to understand something after that is known and remembered. The understanding is the ability to think a level higher than memory or memorization. This gives an understanding that the material taught to students is not just a memorization but more than that with understanding students can better understand the concept of the subject matter itself. It includes the ability to grasp the meaning of something learned, including learning mathematics. One of the math materials that is considered difficult by most students is fractions. Material of fraction contains concepts so complex that to understand those requires the understanding of concepts of the basic material before [5]. Material of fraction must be mastered at least since elementary school because it will always be used for the next level of school. Students often make mistakes in working on fraction problems, including among them mistakes in understanding concepts, i.e. students cannot understand the commands in the problem and fail to identify the operation to be used [6], [7]. Some research on understanding students' concepts of mathematical problems has been carried out, including research conducted by Ramdhani, in his writings it was stated that students had difficulty in solving mathematical problems, especially in proving, this is due to the low understanding of concepts [8]. Other research also mentioned that errors in solving mathematical problems occurred due to understanding of material that is not good [9]. These two studies conclude that the students need understanding in learning mathematics. Based on preliminary observations and interviews with teachers conducted by researchers in several schools, they found that students who have low understanding of concepts have low learning achievement. Students like this generally come from socioeconomic backgrounds classified as lower middle class, namely students in rural and suburban areas. This is supported by the results of research that states that school location has a significant effect on students' mathematics learning achievement, but students who study in rural areas do not have as good performance as students in cities [10]. Other research also found that student performance in urban schools was better than students in rural schools in the fields of mathematics, reading, and science [11], [12]. From some of these studies there are no researchers who focus on seeing differences in understanding the concept of students who come from rural, suburban, urban schools. Based on that, in this paper the researcher suggests how the difference in understanding students' mathematical concepts in solving math problems (specifically fractions) by students from rural, suburbs, and urban. Knowing these differences can be used as input for the government to equalize the quality of education in schools, both in terms of facilities and infrastructure also as an evaluation material for teachers to improve the quality of teaching, especially in rural areas.

2 METHOD
This research is a descriptive study by using a qualitative approach. Qualitative research is research conducted in natural conditions, without treatment, in order that researchers can observe the subject in detail [13]. The research begins by designing a matter of understanding concepts, the material chosen is fraction. It was chosen because this material contains a combination of various mathematical concepts, such as integers, divisions, and others. The questions are designed to contain indicators of concept understanding. Students 'understanding of mathematical concepts according to NCTM [14] can be seen from students' abilities in: (1) Defining concepts verbally and in writing; (2) Identifying and making examples and not examples; (3) Using models, diagrams and symbols to represent a concept; (4) Changing one form of representation to another; (5) Getting to know various meanings and interpretations of concepts; (6) Identifying the characteristics of a concept and recognizing the conditions that determine a concept; (7) Comparing and differentiating concepts.

Questions that have been designed are given to experts to be validated, in this case the validator is a mathematics
lecturer. Validation needs to be done in order to obtain accurate data from the instruments used [15]. The following are validated questions.

**TABLE 1**

UNDERSTANDING MATHEMATICAL CONCEPT PROBLEMS

| Use image to present the fraction | Question | 1. Make image indicating the fraction $\frac{1}{3}$!
|----------------------------------|---------| ![Image](image1.png)
| Change a representational form to mathematic form | 2. Write the fraction corresponding to the image shaded!
| Know various meanings and interpret concepts | 3. Look at the following image!
Female students
Male students
Female Students will share their Martabak equally, and male students also share their Martabak equally.
a. Who will get more Martabak? Male or female student?
b. How much difference is the Martabak of male and female students?
| Identify examples and not examples of worth fractions | 4. Give the check mark (✓) for fractions that are equal to $\frac{12}{12}$, and a cross (✗) for those that are not worth in the following table.
| Redefine (restate) a concept | 5. Finish $\frac{1}{2} + \frac{2}{3} = \ldots$
| Get to know various meanings and interpretations of concepts | 6. Riki will read three books in a row. If each book he reads takes $\frac{1}{2}$ hours, how many time does he need to read all of the books??

**TABLE 2**

PERCENTAGE OF MATHEMATICAL CONCEPT UNDERSTANDING ABILITY

<table>
<thead>
<tr>
<th>Indicator</th>
<th>No. Question</th>
<th>Rural</th>
<th>Suburban</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>69%</td>
<td>96%</td>
<td>90%</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>59%</td>
<td>80%</td>
<td>67%</td>
</tr>
<tr>
<td>C</td>
<td>3a</td>
<td>37%</td>
<td>72%</td>
<td>48%</td>
</tr>
<tr>
<td></td>
<td>3b</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>32%</td>
<td>67%</td>
<td>94%</td>
</tr>
<tr>
<td>E</td>
<td>5</td>
<td>38%</td>
<td>63%</td>
<td>40%</td>
</tr>
</tbody>
</table>

7. Show location $\frac{3}{4}$ on the following number line.

Compare and differentiate the concept of fractions.

8. Short the following fractions from the smallest to the largest: $\frac{2}{3}, 0.3, \frac{7}{8}, 35\%$

These eight items are fractional material with subtopics: fraction as part-whole comparisons (number 1 and 2), fraction as questions (number 3 and 4), fraction as operator (number 5 and 6), and fraction as measures [16]. The next stage is to give valid questions to students from schools in rural, suburban and urban areas. In this case three schools were chosen on the island of Sumatra, Indonesia. Then, the results were analyzed by coding techniques to see the difference in concept understanding between students at the three schools.

**3 RESULT AND DISCUSSION**

After the questions are given, students are given the opportunity to work on the questions for minute. Based on the results of the work on these questions, this obtained an average score of students’ understanding of mathematical concepts as follows.

![Image](image2.png)

Based on the table it can be seen that the highest average understanding of student concepts is obtained by students who come from urban schools, then followed by suburban schools in the middle position, and the lowest is rural schools. This is in line with Howley’s research conclusions which stated that mathematics achievement in rural area was relatively low [17]. In another study it was mentioned that there were large gaps among rural, suburban and urban students, and increased over time [18].
A: (1) Use image to present fractions. A: (7) Use an image to determine the location of fraction between two numbers B: Change form of representation to a mathematical form. C: (3, 6) get to know various meanings and interpretations of concepts. D: Identify examples and non-sample fractions of value. E: Redefine (restate) a concept. F: Compare and Distinguish fraction concepts.

Table 2 Shows that there are significant differences in the ability to understand student concepts in three different schools. Students from rural schools received the lowest percentage in answering each item compared to the other two schools. Whereas students from suburban schools are able to outperform urban schools in question no.2 in changing a form of representation to a form of mathematics; 3a in recognizing various meanings and interpretations of concepts; and problem number 5 in redefining and restating a concept. Following are excerpts of answers for each indicator of the concept understanding of 3 students from three schools.

Based on Fig. 4 can be seen that rural students only rewrite the existing picture on the problem, but cannot solve the problem. Suburban students can represent pictures in the form of fractions (problem 3a), but in pouring back into mathematics they use multiplication operations, so the answers become ambiguous. While question 3b, students misunderstand the problem, consequently the answers given are also incorrect, the same thing happens to urban students. In problem 3a urban students can interpret the problem well, students can change the questions into ordinary fractions, but there is an error in changing to decimal fractions, so the questions cannot be answered completely. Next is question number 4 with indicator identifying examples and non-examples of worth fractions.

Next, problem No. 3 is a story problem, many students cannot answer, and for question No. 3b none of the students was able to solve the problem correctly (see Table 1). According to some studies, story problems are questions with a high degree of difficulty, so students often make mistakes in answering questions [19], [20]. In this problem students are required to be able to understand various meanings and interpretations of the concept of fractions.

![Fig 2. Answer of question number 1, indicator A](image)

Problems of No. 1 dan No. 2 present problems related to material of fraction as whole. Fig. 2 shows that rural students cannot answer correctly, students are trapped by following the pattern of images in the problem, students do not understand the meaning of fractions as part of the whole because a whole section is a circle, 1/3 means 1/3 of the total area as represented in suburban and urban student answers. Problem No. 2 can be answered by students appropriately, they can change a form of representation (picture) into a mathematical form. However, only urban students make the steps as in Fig. 3 of the following.

![Fig 3 Answer of question number 2, indicator B](image)

Next problem No. 3 is a story problem, many students cannot answer, and for question No. 3b none of the students was able to solve the problem correctly (see Table 1). According to some studies, story problems are questions with a high degree of difficulty, so students often make mistakes in answering questions [19], [20]. In this problem students are required to be able to understand various meanings and interpretations of the concept of fractions.

![Fig 4. Answer of question number 3, indicator C](image)

Based on Fig. 4 can be seen that rural students only rewrite the existing picture on the problem, but cannot solve the problem. Suburban students can represent pictures in the form of fractions (problem 3a), but in pouring back into mathematics they use multiplication operations, so the answers become ambiguous. While question 3b, students misunderstand the problem, consequently the answers given are also incorrect, the same thing happens to urban students. In problem 3a urban students can interpret the problem well, students can change the questions into ordinary fractions, but there is an error in changing to decimal fractions, so the questions cannot be answered completely. Next is question number 4 with indicator identifying examples and non-examples of worth fractions.

![Fig 5. Answer of question number 4, indicator D](image)

Figure 5 shows, in general, students can identify examples and non-examples of worth fractions, but there is still an error in the answers of rural students. In addition, rural and suburban students do not make steps to work, so the process is not visible. Figure 6 is the solution to problem No.5 with the indicator to redefine a concept, the concept in question is a fraction.
Rural students can change the form of fractions into ordinary fractions, but do not remember the concept of fraction division. Suburban students can answer correctly, but there are writing operations errors. Urban students can answer perfectly. In Fig. 7, rural students do not understand what is meant in the problem. The answers given seem to appear just like that without a process, and it's wrong.

While suburban students in Fig. 7 understands what is asked about the problem, but does not understand for doing multiplication on fractions. Urban students can answer correctly, meaning the indicator restates the concept of fraction is fulfilled. Problem No. 7 can be completed by all students coming from rural, suburban and urban. This means that you can use a number line to represent numbers.

The final question is about submitting sort fractions. Rural students can answer correctly. Suburban students only give direct answers, without showing the process, he made a mistake in the order of the third and fourth numbers. Urban students can answer correctly. Student answers can be seen in Fig. 9.

In general, the results of the analysis of the students 'answers as a whole show the sequence of understanding students' mathematical concepts in fraction material. Rural students have poor understanding, moderate suburban, and good urban students. In working on the problem, rural students on several questions (numbers 3, 4, 5, and 6) give a random answer, this indicates that rural students do not understand the concept of fractions. Suburban students exhibit characteristics that are almost similar to urban schools in their understanding of concepts, but there are still errors in operations such as in questions number 6 and 8. Errors in operating fractions often occur, one of the causes is carelessness [21]. While urban students have been able to answer questions correctly along with logical rationalization, although there are still misunderstandings in understanding question number 3b, so the answers given are also incorrect. Based on the results of researchers observations and interviews with teachers in these three schools, there are a number of things that are allegedly causing differences in students' understanding of concepts which are summarized in the following table.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Rural</th>
<th>Suburban</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility and infrastructure</td>
<td>Not complete</td>
<td>Complete</td>
<td>Complete</td>
</tr>
<tr>
<td>of school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic</td>
<td>Low</td>
<td>Medium</td>
<td>Complete</td>
</tr>
<tr>
<td>social</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parents’</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>education</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

One of the most important tools in a school is a library that can
be used as a source of learning by students. In rural schools, there is no library available. In suburban schools there is a library, but the collection of books is not as complete as in urban schools. The number of teachers who have been certified in rural schools is less compared to suburban and urban schools. The highest educational background of teachers in rural and suburban schools is strata 1, in urban schools there is already one teacher with a master degree. The social economic condition of rural parents is lower than that of suburban and urban areas. The work of parents of rural students is predominantly farmers and fishermen, suburban and urban workers working as civil servants in schools or offices. The educational background of rural school parents on average is high school, parents of suburban and urban students with the highest strata 1. This is in line with the results of research conducted by McCracken which states that there are several things that cause differences in student achievement, including characteristics school and educational background of parents. Urban schools are wider, have more teachers, administrators, and support staff, and have more subjects and extra-curriculum educations than rural schools. While the education of urban school parents is also higher than in rural schools [22].

4 CONCLUSION
Based on the results of the study it can be concluded that there are differences in understanding students’ mathematical concepts in understanding fractional material. Students from rural schools have difficulty understanding several questions, so the answers given are not correct. Suburban students show that they can understand the commands in the problem, but there are still errors in operating fractions. Meanwhile urban students can understand the questions well and answer the questions correctly. By looking at the difference in the ability to understand this concept can be used as an evaluation material for teachers to improve the quality of teaching and for the government to be able to equity education. This research is only limited to seeing differences in students' understanding of mathematical concepts, but has not yet studied in depth the backgrounds that affect these differences, perhaps other researchers can continue this research.

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REFERENCES