Mathematical Proficiency Profiles of Elementary School Student: Preliminary Study

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Abstract. The purpose of this study was to analyze the mathematical proxies of elementary school class students in Tasikmalaya. This research uses a descriptive-qualitative approach with an exploratory method. The subjects of this study were 100 elementary school students in Tasikmalaya City who were selected using purposive sampling. The data collection techniques used were test techniques, interviews, questionnaires, and document studies. The data analysis technique of this research uses an interactive analysis model with the stages: data validity, data collection, data reduction, data presentation, and drawing conclusions. The results showed: (1) 66.4% of students had mastered the understanding of the concept of fractions; (2) 62.33% of students have mastered the fluency of the procedure; (3) 64% of students have mastered strategic competencies; (4) 62.5% have mastered productive dispositions; and (5) as many as 74.33% of children's productive dispositions can be easily seen. The conclusion of this research is the mathematical proficiency of elementary school students in Tasikmalaya must be improved immediately. Based on the results and conclusions of the research that has been done, the theoretical implications of this study strengthen the theory which states that mathematical proficiency are very important to be developed and have an impact on students.

1. Introduction

Knowledge will always change and develop following the changes and developments in technology and information that is increasingly modern. The subject matter that is most focused on the development of knowledge and technology is mathematics [1]. One alternative way that can be done so that students are able to achieve success in learning mathematics is an understanding of mathematical proficiency. Mathematical proficiency are one of the prerequisites for achieving progress in modern times and provision to face a very competitive 21st century [2].

Mathematical proficiency are the ability of mathematics to explore, predict, and reason logically on a problem in order to solve non-routine problems, communicate, connect mathematical ideas, and other intellectual activities [3]. Mathematical proficiency are the understanding of mathematics as well as skills, knowledge, competencies, and facilities which have the same meaning, namely the results obtained after learning mathematics [4]. Then, mathematical proficiency include mathematical reasoning, mathematical communication, mathematical problem solving, conceptual understanding, mathematical understanding, and creative and critical thinking. [5]. This study examines indicators of mathematical prowess, namely: (a) conceptual understanding, (b) procedural fluency, (c) strategic competence, (d) adaptive reasoning, (e) productive disposition [4]. These five indicators are closely related and influence each other to be able to form students' mathematical proficiency.
Mathematical proficiency make a person appear more confident in using mathematical knowledge in solving everyday problems. Mathematical proficiency enable a person to use various techniques to create useful new ideas, detail, improve, analyze and evaluate their ideas in order to develop and maximize creative efforts in solving life problems both individually and in groups. [6] [7].

Seeing the importance of mathematical proficiency for student life, encouraging some countries that want to advance to prioritize learning mathematics as the main learning [4]. However, the results of observations in several schools show that students do not yet have the ability to solve problems with original strategies. Students have not been able to think about and use their own strategies in solving problems. This is because of the condition of Indonesian students in learning who are still fixated on the examples and procedures provided by the teacher so they do not have the confidence to use their knowledge based on previous learning experiences. This fact is in line with several research results such as [8], [9], & [10].

Based on the background explanation above, the researcher feels the need for exploratory research on the profile of mathematical skills in Indonesia, in particular. The results of this study can be used as a reference, guidelines, and description of the efforts that must be taken to improve the mathematical skills of students at the elementary school level. Therefore, this study aims to analyze the mathematical proficiency profile of fifth-grade elementary school students.

2. Method
This research is a descriptive qualitative research with an exploratory method. This research was conducted in July-August 2020 after students gained learning experience using distance learning methods. Subjects taken in this study were 100 students in twenty schools spread across ten districts in Tasikmalaya City who were selected using purposive sampling and snow ball sampling techniques. The data collection techniques of this research are test techniques and non-test techniques. The test technique is carried out by distributing questions for students to work on. Because there was no face-to-face meeting, data collection was carried out with the help of the teacher to assist the students in working on these questions. Questions can be done at home or at school accompanied by a teacher. This is done so that the data obtained is truly real, not the result of work assisted by parents. Then, non-test techniques are carried out by interview, questionnaire and document study. This research data analysis technique uses an interactive analysis model with data analysis stages, namely data validity, data collection, data reduction, data presentation, and drawing conclusions [11].

3. Results and Discussion
Data on conceptual understanding, procedural fluency, strategic competence and adaptive reasoning were obtained using student test data, while data on productive disposition skills were obtained from filling out a questionnaire on student attitudes. The following are the results of the research which are described per indicator of mathematical proficiency.

3.1. Conceptual understanding
Conceptual understanding is students' understanding or mastery of mathematical concepts, operations and relations. The indicators of conceptual understanding are: (1) restating the concepts that have been studied; (2) classifying objects based on whether the requirements form the concept are fulfilled or not; (3) presents the concept in various forms of mathematical representation; (4) linking various concepts; and (5) developing necessary and / or sufficient conditions for a concept. Based on the test results, as many as 66.4% of students were able to answer questions based on the given concepts, and 33.6% of students seemed not to understand the concept of fractions. The following are essay test questions that are used to measure students 'understanding of concepts along with students' answers that are considered the most ideal.
Questions of conceptual understanding:

Observe the population distribution data based on ethnicity in RT 03 Lengkongsari Village below!

| No | Ethnicity | Number of Population |
|----|-----------|----------------------|
| 1  | Sundanese | 40                   |
| 2  | Javanese  | 18                   |
| 3  | Batak     | 12                   |
| 4  | Balinese  | 10                   |
|    | Jumlah    | 80                   |

Please answer the following questions!

a. What is the share of the total population of the Sundanese people?
b. What is the share of the total population of the Javanese tribe?
c. What is the share of the total population of the Batak tribe?
d. What is the share of the total population of the Balinese tribe?

Based on these questions students are required to restate the concept of fractions which are part of the whole. Students can explain how many parts of the whole terms in question in the environment. Students also seem to master the concept of simplifying fractions. It can be seen from the results of the work after getting the fraction of the residents of each tribe, the student made the fractions into a simpler form. The test data was supported by the results of interviews with several students who stated that the students had been able to restate known concepts and could relate to daily activities. So, it can be concluded that students can master the concept of fractions and have mathematical skills.

This is in line with teroi that a student is said to have mastered mathematical skills in the aspect of understanding concepts if the student is able to restate every concept that has been learned [2]. Students with mathematical proficiency have the expertise to present mathematical concepts in a variety of mathematical representations, link various concepts and determine whether or not enough of a concept can be formed [12][13].

3.2. Procedural fluency

Procedural fluency refers to knowledge of procedures, knowledge of when and how to use them appropriately, and the skills to perform procedures flexibly, accurately, and efficiently. The indicators for procedural fluency are: (1) using procedures; (2) make use of procedures; (3) select procedures; (4) estimating the results of a procedure; (5) modify or refine procedures; and (6) developing procedures.
The test results showed that 62.33% were able to use, select, and take advantage of the procedure. However, there are some students who do not understand what procedure to choose. The following are essay test questions used to measure students' procedural fluency along with the students' answers that are considered to be the most ideal.

**Questions of procedural fluency:**

Mother has a reserve of grain in the granary as much as \( \frac{4}{2} \) tons, Grandmother gave their crops to the mother as much as \( \frac{3}{4} \) tons. How many tons of unhulled do you have now in the rice barn?

**Picture 2. Students answer who are fluent in accordance with procedures**

Based on Figure 2 above, it can be concluded that students have been able to choose which procedure to choose. The students first convert the mixed number to a regular fraction. Then the students determine which procedures should add or subtract. In this case the students were able to find a procedure, namely adding. And the results obtained are in accordance with the expectations of the teacher in working on these questions. This is supported by the results of interviews with several students who show that the smooth operation of the procedure is good, it's just that in modifying and predicting the results of a procedure students still have difficulty. Procedural fluency is the student's ability to apply a concept that is translated into problem-solving steps [14]. The results of this study are in line with other studies that students are said to have mastered the procedure if the student is able to sort and select the appropriate procedure to use and when a procedure is used, and at the highest level students are accustomed to trying to modify existing steps so that they become more efficient. [15] [16].

3.3. Strategic competence

Strategic competence refers to the ability to formulate, present, and solve mathematical problems. As for indicators of strategic competence, namely being able to: (1) understand the problem; (2) presents a problem mathematically in various forms (numeric, symbolic, verbal, or graphic); (3) choosing the right formula, approach or method to solve the problem; and (4) checking the correctness of the problem solving that has been obtained. The test results showed as many as 64% of students were able to understand conditions, look for keywords, present problems and choose suitable presentations. However, there were some students who did not yet understand the selection of problem-solving strategies they faced and did not understand the concepts and procedures for adding fractions. The following are essay test questions used to measure students' strategic competencies along with the students' answers that are considered the most ideal.

**Question of strategic competence:**

A flour trader owns \( \frac{20}{2} \) kg of flour. Then the merchant will sell the flour at a rate of \( \frac{1}{4} \) kg per plastic bag. How many packs of flour will the merchant sell?
3. Students answers who have strategic competence

Based on Picture 3 above, students have been able to understand the problems and how to solve them. It can be seen from the presentation of the problem by changing a mixed fraction to an ordinary fraction. Then understand the problem of adding the fractions in question in that problem. The strategy used in solving this problem is by equating the fraction form then equalizing the denominator first and then looking for the sum. The test results were supported by the results of interviews with several students who stated that students could choose calculating problem-solving strategies. It's just that he is not skilled at checking the correctness of the results of his calculation of the approach or method he chooses. Strategic competence is the strategy of students in understanding the problems that are looking for a common thread so that the problems faced can be resolved properly [17]. Students are said to have strategic competencies if they are able to: (1) understand the situation and conditions of a problem; (2) finding key words and ignoring things that are not relevant from a problem; (3) presents the problem mathematically in various forms; (4) choose a suitable presentation to help solve the problem; (5) find the mathematical relationship in a problem; (6) selecting and developing an effective solution method in solving a problem; (7) find solutions to the problems given [4][18].

3.4. Adaptive reasoning

Adaptive reasoning refers to the capacity to think logically about the relationships between concepts and situations, the ability to think reflective, the ability to explain, and the ability to provide justifications. There are indicators of adaptive reasoning, namely: (1) formulating assumptions; (2) provide reasons or evidence for the truth of a statement; (3) draw conclusions from a statement; (4) checking the validity of an argument; and (5) finding a pattern in a mathematical phenomenon. The test results showed that 62.5% were able to formulate predictions and were able to find patterns in systematic symptoms. The following are essay test questions used to measure students 'adaptive reasoning along with students' answers that are considered the most ideal.

**Question of adaptive reasoning:**

At school there will be competitions which must be followed by grade 4, grade 5 and grade 6 students. The school principal divides it into 7 from grade 4, and 14 from grade 5, and the rest from grade 6. If the total number of participants is 56 people, how many participants are there from each class?
Based on the picture above, students have been able to make accurate guesses on the question description by describing it in the known and asked sections. Then, students understand what procedures to use with a pattern like that. Finally, students are able to conclude the results of their own calculations. The results of the interviews show that students have been able to formulate assumptions, draw conclusions from a question, provide valid arguments and find patterns of mathematical symptoms, but are less skilled in providing reasons or evidence of the correctness of their statements. The results of this study are supported by a theory which states that students who have adaptive reasoning will think logically about mathematics material and can explain and make justification for something they do [19]. Furthermore, adaptive reasoning is the ability to draw logical conclusions, estimate answers, provide an explanation of the answer concepts and procedures used, and judge their correctness mathematically [20].

3.5. Productive disposition

Productive disposition is the tendency to have productive habits to see mathematics as sensible, useful, meaningful and valuable and to have confidence and persistence in learning / working with mathematics. The indicators of productive disposition include: (1) enthusiastic; (2) not giving up easily; (3) self-confidence; (4) have high curiosity; and (5) willing to share. The results of the questionnaire showed that as many as 74% of students had good productive dispositions. Then, the highest score is found in the statement having a resilient and confident attitude, followed by a statement of having an interest in learning and the last statement having a curiosity. This is in line with the results of the interview which stated that students are confident that they can get good grades in mathematics and believe that they are talented in mathematics if they work hard. In addition, students also do not give up easily if they experience difficulties and will not hesitate to ask the teacher. Students have a high interest in learning which can be seen from their efforts to find other reference sources such as private tutors or books from their former siblings. However, the students answered that sometimes they learned mathematics on their own accord, more often if the parents asked them to do so, the students preferred to do easy math problems. Students' productive disposition is a very important component because it can influence other indicators of mathematical skills. A student who has a high productive disposition tends to be able to develop their mathematical skills in terms of conceptual understanding, procedural fluency, strategic competence, and adaptive reasoning. [21]. Differently, those who have these four abilities tend to develop their productive disposition [22].
4. Conclusion

Based on the results of the research and discussion above, it can be concluded that: (1) 66.4% of students had mastered the understanding of the concept of fractions; (2) 62.33% of students have mastered the fluency of the procedure; (3) 64% of students have mastered strategic competencies; (4) 62.5% have mastered adaptive reasoning; and (5) as much as 74.33% of students' productive dispositions can be easily seen. Therefore, as a whole, it can be concluded that elementary school students have quite good mathematical skills. The weakness of this research is that it only analyzes a few elementary school students. To generalize the mathematical skills of elementary school students based on the data of 100 research subjects, it is considered that they do not reflect the population. Therefore, further researchers are expected to be able to expand research subjects such as high school, tertiary education, to expand the scope of research subjects so that the data is more representative.

Based on the results and conclusions of the research that has been done, the theoretical implications of this study strengthen the theory which states that mathematical proficiency are very important to be developed and have an impact on students. The results of this research can also be taken into consideration by various related parties to further develop mathematical proficiency in learning. Based on the research conclusions, there are several recommendations for related parties. Teachers should improve the quality of teaching in the classroom by regularly creating teaching methods and strategies to improve mathematical proficiency that require an active learning climate. Principals of schools are expected to strive to improve students' mathematical proficiency by providing learning resources and developing teacher competencies. For future researchers, they should be able to investigate this problem further by conducting research on student learning outcomes using the three mathematics textbooks that have been studied.

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