Profile of Mathematical Connection Abilities of Fraction Materials in Class V Students Viewed From Math Ability

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Abstract: This study aims to describe the mathematical connection ability of fractions of fifth grade MI Sunan Giri Boro students in terms of students' mathematical abilities, namely the upper, middle, lower, and general groups. Method used qualitative descriptive. Data collection by documentation, tests, and interviews. The results showed that the ability of students was classified as very low with a group percentage of 47.40%, 21.19% middle, below 9.38%, and in general 24.83%. It is recommended for teachers' men to increase understanding of the concept of fractions, accuracy, and student interest so that the mathematical connection ability of students' fraction material increases.

Keywords: mathematical connection, fraction, students

1. INTRODUCTION

Mathematics is one of the disciplines that have many relationships with various things. This relationship occurs both in mathematics itself and outside mathematics. So that the ability of students to understand and use the relationship between mathematics and these various things is needed in learning mathematics. This ability is called mathematical connection ability.

Mathematical connection ability is one important component in learning mathematics. The National Council of Teaching Mathematics (NCTM) (in Anandita, 2015) states that if students can connect mathematical concepts mathematically, then students will have a deeper understanding and can last longer. With the importance of this mathematical connection ability, the NCTM (in Sitaresmi, et al., 2016) places connections (connections) as one of the basic mathematical abilities in addition to problem-solving, reasoning and proof, communication (communication), and representation (representation). Besides, Rohansyah (in Yuniawatika & Nuraeni, 2016) mentioned that mathematical connections can help students to broaden their perspectives, view mathematics as an integrated part rather than as a collection of topics, and recognize the relevance and application both in the classroom and outside the classroom.

Mathematical connection capability can be measured using several indicators. Some experts make indicators that can be used to measure the ability of these mathematical connections in their respective opinions. But in broad outline there are several indicators of mathematical connection ability as used by Sugiman (2008) in his research, namely: (1) connections between mathematical topics that link between concepts or principles in the same topic; (2) connections between topics in mathematics that link between material in certain topics with material in other topics; (3) connection between materials with knowledge other than mathematics; and (4) connections with everyday life that children may encounter.

Although the ability of mathematical connections is very important, in reality, the ability of mathematical connections of Indonesian students is still relatively low. The results of the Program for International Student Assessment (PISA) study in 2009 (in Rismawati, et al., 2017) showed that only 5.4% of secondary school students in Indonesia could solve problems that needed mathematical connections. This situation ranked Indonesia 61 out of 65 countries in the 2009 PISA (Effendi, 2012).

In addition to the PISA results, several studies have also stated that students' mathematical connection abilities are still relatively low. Sugiman research (2008) concluded that the average level of students' mathematical connection ability was relatively low at 53.8%. The highest ability is in the interconnection indicator in mathematical topics and the lowest ability is in the connection indicator between mathematical topics.

In addition to these studies, some studies discuss students' mathematical connection abilities based on their mathematical abilities. Research Nurfitria, et al (2013) states that students in the upper group have a high ability

to connect (86%), students in the middle group have a relatively low ability to connect (74%), and students who are in a group under their mathematical connection abilities classified as very low (32%). Then the research Ramdhani, et al (2016) concluded that high-ability students can master all the indicators, moderate-ability students can master one indicator, and low-ability students cannot master all the indicators of mathematical connection ability tested.

Results of the study, special attention should be given to education in Indonesia, especially in elementary school (SD) / Islamic Elementary School (MI). This is because SD / MI is a very important level of education in the formation of basic concepts and skills that are useful for students to prepare to continue their higher education or to be used in everyday life. So that if the understanding of the concepts provided in SD / MI is good, it will also be good for the concepts to be formed at the higher education level.

One concept that has a lot to do with various things is fractions. In the 2013 curriculum, fractions are material that has begun to be taught in class II. In class V, almost all fractional material has been taught (Regulation of the Minister of Education and Culture / Permendikbud Number 24 of 2016). According to Walle (2006), fractions are always a pretty tough challenge for students, even to middle grades. Wearne & Kouba (in Walle, 2006), states that the results of the National Assessment of Educational Progress (NAEP) test indicate that students have a weak understanding of the concept of fractions. Therefore, to understand how the mathematical connection ability possessed by grade V students in fraction material, a study was conducted under the title "Profile of Mathematical Connection Abilities of Fraction Materials in Class V Students Viewed from Math Ability".

2. METHOD

The method used in this research is descriptive with a qualitative approach. This research was conducted for 5 months, which was divided into several stages, namely preparation, implementation, data analysis, and drawing conclusions. Subjects in this study were 27 students of class V MI Sunan Giri Boro which were divided into 3 groups based on students' mathematical abilities, namely 6 upper group students, 16 middle group students, and 5 lower group students.

In conducting data collection, researchers used documentation techniques, written tests, and interviews. The documentation process in this study was carried out by taking pictures during the research process and sampling students' work in each group by using a camera.

Written tests are used to obtain the main data in research. In the written test, used the instrument in the form of sheet test connection capabilities mathematical consisting of 8 about the description and is based on four indicators of the ability to connect mathematical ie, 2 about the connection inter math topics, 2 about the connection between math topics, 2 about the connection of

mathematics with an eye other subjects, and 2 problems of mathematical connections with everyday life. After the questions are compiled, the questions are validated by validity and reliability tests.

Validity tests by experts (1 mathematics lecturer and 2 class V teachers) concluded that the compiled questions could be used with improvement. After repairs according to the advice of the validator. This question was tested on 12 students of MI V grade Terpadu Ash Sholih Tulungagung Regency. After being corrected using an instrument in the form of a scoring guideline, the scores obtained were processed using the moment product correlation formula with a Pearson rough number and the results were obtained that 6 compiled questions had very high validity and 2 questions had high validity so that all questions could be used in research. Besides, the reliability test using the Alpha formula obtained the results that the test instruments compiled were declared reliable with a reliability coefficient of 0.94 (very high).

In addition to written documentation and tests, interviews were also used in this study. The interview used is an unstructured interview to confirm and explore students' answers. The instrument used in this interview was in the form of interview guidelines arranged based on an outline of the problem.

The data that has been collected is then analyzed using the concept of Miles & Huberman (in Sugiyono, 2010), namely: (1) data reduction; (2) data display (data presentation); and (3) Conclusion drawing / verifying (conclusions/verification). Reduction of test result data is carried out in the following steps: (1) correcting students' answers; (2) changing students' scores to percent scores; and (3) finding the average percentage score of each group, the average percentage score of each group in each indicator, the average percentage of student scores in general, and the average percentage of student scores in general in each indicator.

After the data has been reduced, the next step is the presentation of data. Data is presented in the form of tables and graphs which are then described based on the following Table 1. Based on the final step in data analysis is concluding. Conclusions drawn in this study were done by concluding the data that has been presented to find out how the mathematical connection ability of fraction of upper group students, middle group students, lower group students, and fifth-grade students of MI Sunan Giri Boro in general.

Table 1 Qualification Ability

No.	Mastery Level	Criteria
1	$86\% < x \leq 100\%$	Very High
2	$76\% < x \leq 85\%$	High
3	$60\% < x \leq 75\%$	Middle
4	$55\% < x \leq 59\%$	Low
5	$x \leq 55\%$	Very Low

3. RESULTS

After analyzing the data obtained mathematical connection capabilities of the following fractional material. From Table 2 it is known that the mathematical connection ability of fractional material possessed by each group and students, in general, is in the very low category but with a different average percentage. Students in the upper group have an average percentage of 47.40%. Middle group students have an average percentage of 21.19%. The lower-class students have an average percentage of 9.38%. And students, in general, have an average percentage of 24.83%.

Table 2 Mathematical Connection Capabilities

Student	Average Percentage Indicator (%)				
	I	II	III	IV	All
Upper group	55,21	45,83	44,79	43,75	47,40
Middle group	15,63	16,41	23,05	29,69	21,19
Lower group	6,25	5,00	11,25	15,00	9,38
General groups	22,69	20,83	25,69	30,09	24,83
Upper group	55,21	45,83	44,79	43,75	47,40

If the data is presented in the form of a graph the mathematical connection ability of fractional material possessed by students is as follows. From this graph, it is known that the students in the upper group have the highest ability on the interconnection indicator in mathematical topics and the lowest ability on the indicator of the mathematical connection with everyday life. Middle group students have the highest ability on indicators of mathematical connections with everyday life and the lowest ability on indicators of connection between mathematical topics. Lower class students have the highest ability to be an indicator of mathematical connections with daily life and the lowest ability to be an indicator of connections between mathematical topics. And students in general students have the highest ability on indicators of mathematical connections with everyday life and the lowest ability on indicators of connections between mathematical topics.
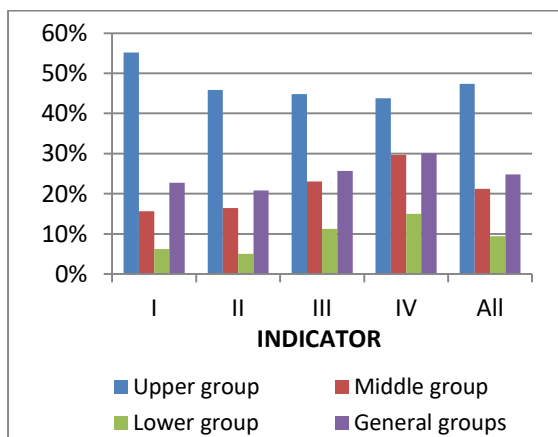

Fig. 1. Graph of Mathematical Connection Ability

4. DISCUSSION

Based on the results of the analysis that has been delivered, it is known that the mathematical connections of the fractional material are as follows.

4.1 Upper Group

Upper group students are students with high mathematical abilities in their class. However, based on the results of the analysis it is known that middle group students have very low mathematical connection ability in fractions. This situation is caused by students in the upper group having different abilities in each indicator being tested.

In the interconnection indicator of mathematical topics from the 6 upper group students, there are 3 students have very low ability, 1 student who has the middle ability, and 2 students who have the very high ability. This situation causes the ability of upper group students in inter-topic mathematical connection indicators is classified as low with an average percentage score of 55.21%. So, it can be said that upper group students are less able to understand and use the relationships between concepts in fractions.

Next to the second indicator, namely connections between mathematical topics, upper group students have the very low ability with an average percentage score of 45.83%. This shows that the students in the upper group do not master the connection indicators between mathematical topics. This means that upper group students have not been able to understand and use the relationship between fractions with other mathematical topics properly.

On indicators of mathematical connections with other subjects, students are required to be able to understand and use the relationship between concepts in fractions (mathematics) with concepts in other subjects. The results of the analysis indicate that the upper group students have not mastered this indicator. The ability of top group students in this third indicator is classified as very low with an average percentage score of 44.79%.

In the last indicator which is the mathematical connection with daily life, upper group students have very low abilities. The ability of the upper group in this indicator is the lowest compared to other indicators. This shows that the upper-class students are weaker when they have to work on problems related to daily life. Students in the upper group only have an average percentage score on this indicator of 43.75%. So it can be said that the upper group students also have not mastered this indicator.

From the discussion of students' abilities in each of the above indicators, it is also known that the upper group students have not been able to master all the indicators tested. This is very different from the study of Ramdhani, et al (2016) which states that high-ability students can master all the indicators tested. Based on this, it is known that when viewed from all the indicators tested the upper group students have very low mathematical connection abilities in fractional material. This is supported by the results of the analysis of the ability of the upper group in all indicators which also shows that the mathematical connection ability of the upper group students is in the very low category with an average percentage score of

47.40%. This finding is different from the results of research by Nurfitria, et al (2013) which concluded that students in the upper group have high mathematical connection abilities. From these results, it can be concluded that the upper group students have not been able to understand and use the relationship between mathematics (in this case fractions) with other things.

4.2 Middle Group

The results of the analysis showed that middle group students had very low mathematical connection ability in fractional material (21.19%). This is different from the results of research Nurfitria, et al (2013) which states that students who are in the middle group have a relatively moderate connection ability. This situation occurs because middle group students have different abilities in each indicator.

In the interconnection indicators of mathematical topics all students who are members of the middle group have abilities that are in the very low category. The situation caused the ability of middle group students in inter-topic mathematical connection indicators was also classified as very low with an average percentage score of 15.63%. This shows that students have not been able to understand and use the relationships between concepts in fractions properly. The ability of middle group students in this indicator is the lowest compared to other indicators. This means that middle group students are weak in understanding the relationship between fraction concepts.

On the connection indicator between mathematical topics, 10 out of 16 students in the middle group did not have a score. This causes the middle group students to have abilities that are also classified as very low in this indicator, with an average percentage score of 16.41%. This shows that middle group students also have not mastered all indicators tested or can be said to have been unable to understand and use the relationship between concepts in fractions with other mathematical topics.

From the results of the analysis on the third indicator of mathematical connections with other subjects, middle group students have very low ability (23.05%). This also shows that middle group students have not yet mastered this third indicator. Then, p there is an indicator of mathematics connection with daily life, middle group students have an average percentage of 29.69%. On average this percentage is classified as very low. This means that middle-class students have not been able to master this fourth indicator well.

Based on the description above, it is known that the highest ability of middle group students is on the indicator of mathematical connection with daily life while the lowest ability is on the indicator of the connection between mathematical topics. This shows that middle group students are weaker in understanding and using relationships between concepts in fractions. Also, the results of the analysis also revealed that middle group students were not able to master all the indicators tested. This is still not in line with the results of research by Ramdhani, et al (2016) which shows that medium-skilled students can master 1 indicator tested. Thus, it can be concluded that middle group students have

mathematical connection ability of broken material which is classified as very low.

4.3 Lower Group

In the interconnection indicators of mathematical topics, the ability of lower-class students is in the very low category with an average percentage of 6.25%. All lower-class students have the very low ability on this indicator. The highest average percentage owned by the lower-class students in this indicator is only 18.75% which is owned by S21, while the lowest average percentage is owned by S3 and S24 which is 0.00%.

Very low mathematical connection ability is also experienced by students under the group in connection indicators between mathematical topics. This connection indicator between mathematical topics links material in certain topics with the material in other topics (Sugiman, 2008). From the analysis, it is known that the average percentage in this indicator is only 5.00%. This is because all students in the lower class have the very low ability in this indicator. The situation shows that the students in the lower group have not mastered the indicators of connection between mathematical topics. So, it can be said that the lower-class students have not been able to understand and use the relationship between fractions with other mathematical topics.

A similar situation also occurs in indicators of mathematical connections with other subjects. The ability of students on this indicator is also very low with an average percentage score on this indicator of 11.25%. This shows that students have not mastered indicators of mathematical connections with other subjects.

Then in the last indicator, the same thing still happened. The ability to connect mathematics with daily life that is owned by students in the lower group is in the low category with an average percentage of 15.00%. The highest ability in this indicator is only 37.50% owned by S3 and the lowest is 0.00% owned by S25. This shows that the students from the lower level also have not mastered this fourth indicator.

Based on the description of the ability of lower-class students who are reviewed in each indicator, it is known that the ability of the lower-class students is highest on the indicator of mathematical connections with daily life while the lowest ability is on the indicator of connections between mathematical topics. This shows that the lower-class students are weaker in understanding and using the relationship between fractions and other mathematical topics.

Besides, from the results of the discussion above it is also known that lower-level students have not mastered all the indicators tested. This is also supported by the results of interviews with 2 middle group students who stated that all the questions tested were classified as difficult. This shows that indeed the lower-class students have not mastered all the indicators tested. This situation is also by with the results of research Ramdhani, et al (2016) which states that low-ability students cannot master all the indicators of mathematical connection ability tested.

In addition, because the mathematical connection ability in all the indicators described above is very low, it can be concluded that the mathematical connection ability of fractional material possessed by lower-class students is also

very low. Based on the analysis results the average percentage score is only 9.38%. This situation is consistent with the results of research Nurfitria, et al (2013) which states that students who are in the group under the mathematical connection ability are classified as very low. This shows that the lower-class students have not been able to understand and use the relationship between fractions and various things.

4.4 Generally

By looking at the mathematical connection ability of all groups previously described, it can be seen that the fifth-grade students of MI Sunan Giri Boro generally have very low mathematical connection abilities in fractional material. This is evidenced through the results of the analysis of student scores that place students, in general, have a relatively low ability with an average percentage of 24.83%. This situation can also be seen from the abilities of each student. Of the 27 students who were the subjects of the study, 92.60% of them (25 students) had very low mathematical connection ability in fractional material. Whereas 2 other students are in the medium category. This also proves that in general the fifth-grade students of MI Sunan Giri Boro have very low mathematical connection abilities.

In interconnection indicators of mathematical topics in general students have mathematical connection abilities of fraction material that are in the very low category with an average percentage score on this indicator is 22.69%. This shows that the fifth-grade students of MI Sunan Giri Boro have not been able to understand and use the relationship between concepts in fractions. From the results of processing the test scores, it is known that the students' abilities in this indicator are varied, but most students have very low abilities with an average percentage score. This is what causes the ability of students in general on this indicator is very low.

In the second indicator that is the connection between mathematical topics, the ability of the results of the analysis is known that 13 of 27 students subject to the study did not get a score at all. This situation causes the connection indicators between mathematical topics students, in general, to have a very low mathematical connection ability, the average percentage score of 20.83%. This shows that the fifth-grade students of MI Sunan Giri Boro have not mastered the connection indicators between mathematical topics.

Then in the mathematical connection indicator with other subjects in general students have mathematical connection ability of broken material which is in the very low category with an average percentage score on this indicator is 25.69%. It also shows that in addition to the two indicators discussed earlier, students in general also have not mastered this third indicator.

Whereas the indicator of mathematics connection with daily life in general students has an average percentage score of 30.09%. This ability category is also the same as the ability in the two previous indicators, which is very low. Nevertheless, there are 2 students have very high abilities in this indicator, namely S1 and S2 (87.50%). But there are also 4 students do not have a score in this indicator, namely S14, S20, S23, S25.

Based on the mathematical connection ability of students' fractional material in general in each indicator that has been described, it is known that the highest student ability is in the indicator of mathematical connection with daily life while the lowest ability is in the connection indicator between mathematical topics. This is a new finding because it is different from the results of Sugiman (2008) research which shows that the highest mathematical connection ability of students is in the indicators of connection between mathematical topics, while the lowest ability is in indicators of connections between mathematical topics. Based on this, it is known that fifth grade MI Sunan Giri Boro students are generally weaker in understanding and using the relationship between fractions and other mathematical topics.

In addition, from the results of the analysis, it is also known that most students have been able to understand the questions and make a plan for solving them well, but found several problems that cause this very low ability. The first problem is the lack of accuracy students have. The second problem is the lack of students' ability to change and perform fraction counting operations. In other words, students' understanding of concepts in fractions can be said to be still weak. This is in line with the results of the NAEP test which states that students have a weak understanding of the concept of fractions (Wearne & Kouba in Walle, 2006).

Besides, from the results of interviews with 8 students, another problem was also found, namely the low interest of students in mathematics. Of the 8 students who were interview respondents, 7 of them stated that they did not like mathematics. So, it can be concluded that the low interest in mathematics is also one of the causes of the very low mathematical connection ability of fractional material owned by the self.

The things above can prove that the mathematical connection ability of fractional material possessed by grade V students is very low. This situation is almost the same as the results of research conducted by Sugiman (2008), Anandita (2015), and Sitaresmi, et al. (2016) which states that students' mathematical connection abilities are classified as low/underprivileged. This shows that grade V students, in general, have not been able to understand and use the relationship between fractions and various things.

5. CONCLUSION

From the results of the study, it can be concluded that the mathematical connection ability of fractional material possessed by fifth-grade students is generally classified as very low. The state of very low ability to have also occurred in each group. Although the ability of each group is in the same category, each group has an average different percentage score. Students in the upper group have an average percentage of 47.40%. Middle group students have an average percentage of 21.19%. Lower-class students have an average percentage of 9.38%. While the average percentage of scores owned by students of class V MI Sunan Giri boro, in general, is 24.83%.

It is recommended for teachers to foster student interest in mathematics first. Furthermore, teachers should be able to design appropriate strategies to improve students' understanding of concepts in fractions. Also, teachers should

also guide to students to be more careful in doing something. With this, it is expected that problems that cause the very low ability of these students can be minimized so that the ability of students' mathematical connections, especially in fraction material can be increased.

For students, this study was about her can be a motivation to keep active in learning mathematics, in particular fractions. Then, for advanced researchers, it is recommended to conduct development research with the aim to improve the mathematical connection capabilities of fractional material possessed by students. As for the parties involved in education policyholders, the results of this study can be a discussion of the extent to which students' mathematical connection abilities, so they can determine the right steps to overcome the situation.

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