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ANALYSIS OF THE MATHEMATICAL CONNECTION ABILITY OF CLASS VIII-I STUDENTS OF SMP NEGERI 11 TANJUNGPINANG ON SOCIAL ARITHMETIC MATERIAL

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ABSTRACT

To achieve learning goals, students from every level of education must be involved in learning experiences to develop their mathematical connection abilities. This research aims to discover more detailed pictures of students' mathematical connection abilities on indicators that they are still lacking. The type of research that will be used in this research is qualitative research with descriptive approach. This research will be carried out at SMP Negeri 11 Tanjungpinang using research subjects, namely 33 students in class VIII-I. However, researchers only described 9 of 33 students. Researchers collected data using mathematical connection test questions and student interviews and the data analysis technique used was the data analysis technique proposed by (Miles and Huberman in Angelina, M., & Effendi, K.N.S., 2021) which consists of data reduction, data presentation, and concluding with the results of the level of students' mathematical connection abilities consisting of 3 students in the high category, 5 students in the medium category and 25 students in the low category. Students who have high mathematical connection abilities can solve the problems given. Students who have moderate mathematical connection abilities tend to be able to solve problems even though there are errors in answering questions and incomplete writing of answer results. Students who have low mathematical connection abilities tend not to be able to solve problems to measure mathematical connections. When researchers researched this, researchers found that schools were still implementing the K-13 curriculum, where students were presented with learning material from teachers. This makes students rarely explore their abilities in connecting the lessons they have learned.

Keywords: Analysis, Mathematical connection, Junior high school students

INTRODUCTION

Mathematics is an important science for humans, not only in schools use mathematics, in everyday life humans also use mathematics to make human activities easier. From ancient times, mathematics has been very necessary in solving and resolving everyday problems, for example, trading systems, construction, and other calculations. Until now, mathematics is still very necessary to solve problems in everyday life.

Therefore, the importance of studying mathematics cannot be separated from the perspective of life. By learning mathematics, a person will become accustomed to thinking systematically,

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critically, and honing human creativity. (Fathani in Juanti.S. et al., 2021) expressed his opinion that mathematics must be used as a tool to support knowledge, to shape human attitudes and also as a guide to human thinking. Seeing how important mathematics is in the context of everyday human life, therefore mathematics really needs to be understood, even mastered by the entire community and girls at school as the next generation are no exception. Mathematics is a subject taught at elementary, middle school, high school and even college levels. One of the materials taught at junior high school (SMP) level is social arithmetic. Where this material has applications in everyday life, for example in purchasing accessories at wholesale stores and purchasing accessories at accessories stores. Usually wholesale stores sell goods at cheaper prices compared to buying retail goods. This activity is related to social arithmetic material. The types of values in social arithmetic that are related to social arithmetic include overall value, per unit value, and partial value. Social arithmetic itself studies the relationship between numbers and problem solving in everyday life. Another science besides mathematics that is commonly found in people's daily lives is economics. For example, the relationship between social arithmetic and tax matters, discounts, simple interest, profit and loss, and so on. As well as making it possible to connect mathematical connection abilities between concepts in mathematics such as comparing the selling prices of two shops. This allows students to easily visualize how this material relates to social life. Through learning social arithmetic, students are expected to be able to apply the basics of mathematical calculations that have been explained to everyday life (Daniatun et al., 2022)

In junior high school students study material regarding social arithmetic with the hope that students will have Basic Competencies (KD), namely being able to understand and be able to solve problems related to social arithmetic (sales, purchases, discounts, profits, losses, single interest, percentages, net, net and tare) by interpreting into contextual problems.

This has happened requires students to have the ability to analyze social arithmetic well. Students need mathematical connection skills, namely connecting concepts in mathematics. Apart from that, students also need to be able to apply mathematics in everyday life. Students who have good mathematical connection skills will easily understand the relationship between material in mathematics and can also easily relate mathematics to their daily lives.

This mathematical connection ability can also be interpreted as the connection between concepts, ideas, processes, and so on in everyday life, linking mathematics with other sciences and the ability to link concepts or procedures in mathematics. In mathematics, matter is reciprocal and connected to each other. Learning will be meaningful when students understand that the concepts they are learning are relevant to everyday life (Amalia et al., 2019). This also agrees with (Suherman in Hadin et al., 2018) that mathematical connection is a person's ability to connect concepts with each other, with other subjects or other fields of study, and apply them in life.

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(*National Council of Teacher of Mathematics* dalam Bakhril, M.S., 2019) Formulating learning objectives has important things in it, namely: learning to communicate, learning to reason, learning to solve problems, learning to relate ideas to everyday life, forming a positive attitude towards mathematics. To achieve these learning objectives, students from every level of education must be involved in learning experiences to be able to develop their mathematical connection abilities (Widyawati et al., 2021). Judging from this presentation, the ability to make mathematical connections is one of the important things for achieving a learning goal.

This mathematical connection ability has several indicators put forward by (NCTM in Ekawati.S., 2018), namely: discovering and applying the relationship of ideas in mathematics, understanding the relationship of ideas in mathematics and creating a comprehensive connection, discovering and apply mathematics into the environment until mathematics comes out. For students to be able to meet the indicators of achieving mathematical connections, efforts are needed to understand mathematical connections for students' understanding of mathematical concepts. Mathematical connections can help students understand the concepts in mathematics and link them into and out of mathematics.

However, even though mathematical connection skills are very important for students to master, in reality mathematical connection skills in Indonesia are still relatively low. The Program for International Student Assessment (PISA in Khaira Nurliza, 2021) announced by the Organization for Economic Cooperation and Development (OECD) shows that for mathematics literacy, Indonesia is still in a low position. In 2018, Indonesia received an average score in mathematics competency of 379 points from the average score of OECD countries for mathematics ability of 489 points, Indonesia was ranked 72nd from the bottom out of 79 survey participants. Supported by the results of research carried out by Sugiman in 2008, the results of students' connection abilities in his research reached 53.8%. Students' achievements in mathematical connections are still felt to be lacking or relatively low. To provide students with the view that mathematics is a dynamic science, therefore connections are made between mathematical reasoning and problem solving in their lives so that students are able to further develop their abilities in associating or connecting material in mathematics, linking mathematics with other subjects. and mathematics with students' daily lives.

One effort to improve students' mathematical connection abilities is the need for students to practice questions which trigger an increase in students' mathematical connection abilities. Story problems can be used as a test of students' mathematical connection abilities. This is because students can study the problem before they solve the mathematical problem, using logic to find or solve the mathematical problem. (Soedjadi in Nafi'an, 2011) to solve math problems in the form of stories, the following steps are needed: read the problem carefully to understand the meaning of

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each sentence, express what the question asks and what calculations are needed, create a mathematical model, complete the mathematical model that has been created, and change the answer from the mathematical model into the original answer to the question. This is in accordance with what is needed to measure students' mathematical connections.

From the results of observations and interviews with teachers in the field of mathematics as initial observations that researchers carried out at SMP Negeri 11 Tanjungpinang, in general students showed weak mathematical connections seen from their daily learning activities. Students find it difficult to connect mathematics with everyday concepts. For example, what is known in the question is the total price of the item, whereas what the question asks is the unit price of the item. And other examples such as calculating profits and losses in percentage form. Students still find it difficult to imagine and solve these problems. Apart from that, there are still many students who answer the questions given without using the steps so that students find it difficult to express their understanding of the questions given. The aim of this research is to get a more detailed picture of students' mathematical connection abilities on indicators that they feel are still lacking. So, the researcher was interested in raising this problem into a thesis research with the title **"Analysis of the Mathematical Connections of Students at SMP Negeri 11 Tanjungpinang on Social Arithmetic Material"**

METHODS

The type of research that will be used in this research is qualitative research with a descriptive approach. Qualitative research is collecting as much data as possible and in depth to explain a phenomenon. According to Nazir (2011) the descriptive method is a method for researching a condition, object, group of people, or events that occur in the present. This method begins with making initial observations or observations to look for a problem that occurs at the research site to be researched, then the researcher will go directly to the field to be able to see the factors that cause why the problem needs to be raised. This research describes a situation that was carried out to obtain quality information to determine students' mathematical connection abilities in solving social arithmetic problems. Researchers want to collect information and reveal information related to students' deep mathematical connections.

This research was carried out at SMP Negeri 11 Tanjungpinang Jl. Flamboyant Kp. Bugis, District. Tanjungpinang City, Tanjungpinang City, Prov. Riau islands. Using research subjects, namely 33 students in class VIII-I. However, researchers only described 9 students. This is taken based on several criteria, namely: student consistency in completing tests and when answering questions during interviews, student test scores and student completeness in completing tests.

Data collection in this research is in the form of tests and interviews. The test is given to students with 5 questions on social arithmetic material. Interviews themselves are used to see possible cases

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that will arise during research. Such as student consistency in answering questions and interviews as well as student clarification in solving questions. This research instrument uses research from (Desthiani et al., 2023) where in his research, he developed test questions to see students' mathematical connection abilities.

The data analysis technique used in this research is the data analysis technique quoted from (Burhan in Khaira Nurliza, 2021), namely that there are several processes for analyzing qualitative data: data reduction, data presentation and drawing conclusions.

FINDINGS

Table 1. Results of Students' Mathematical Connection Ability Test

No.	Student Code	Score Per Question Item					Total Score	Percentage Archievement	Category
		1	2	3	4	5			
1.	A1	4	0	0	0	0	4	20%	Low
2.	A2	4	2	2	1	2	11	55%	Currently
3.	A3	4	0	0	0	0	4	20%	Low
4.	A4	4	4	4	0	2	14	70%	High
5.	A5	4	1	0	0	0	5	25%	Low
6.	A6	2	0	0	0	0	2	10%	Low
7.	A7	3	0	1	0	0	4	20%	Low
8.	A8	4	2	2	0	3	11	55%	Currently
9.	A9	0	0	0	0	0	0	0%	Low
10.	A10	4	1	0	0	0	5	25%	Low
11.	A11	4	2	1	1	2	10	50%	Currently
12.	A12	3	0	0	0	0	3	15%	Low
13.	A13	4	4	3	1	2	14	70%	High
14.	A14	3	0	0	0	0	3	15%	Low
15.	A15	4	2	0	0	0	6	30%	Low
16.	A16	3	0	0	0	0	3	15%	Low
17.	A17	3	2	1	0	2	8	40%	Low
18.	A18	4	2	1	1	2	10	50%	Currently
19.	A19	2	0	0	0	0	2	10%	Low
20.	A20	4	2	0	0	0	6	30%	Low
21.	A21	4	2	2	0	0	8	40%	Low
22.	A22	4	0	0	0	0	4	20%	Low
23.	A23	4	0	0	0	0	4	20%	Low
24.	A24	3	0	0	0	0	3	15%	Low
25.	A25	3	0	0	0	0	3	15%	Low
26.	A26	0	0	0	0	0	0	0%	Low
27.	A27	3	0	0	0	0	3	15%	Low
28.	A28	4	4	2	0	2	12	60%	Currently
29.	A29	4	0	0	0	0	4	20%	Low
30.	A30	4	4	4	0	4	16	80%	High

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31.	A31	4	2	1	0	0	7	35%	Low
32.	A32	3	0	0	0	0	3	15%	Low
33.	A33	4	1	0	0	0	5	25%	Low

From the results of students' mathematical connection tests, it is known that dominant students have low mathematical connection abilities. There is a summary of the total number of students who have high, medium, and low levels of mathematical connection ability. Apart from that, students are also classified according to their level of mathematical connection ability as follows:

Table 2. Classification of Mathematical Connection Capabilities

Classification of Students' Mathematical Connection Ability	
Category	**Many Subjects**
High	3
Currently	5
Low	25

This classification of students' mathematical connection abilities is obtained from the results of students' mathematical connection tests. Where students work on 5 test questions. From the results of the classification of students' mathematical connection abilities, several subject representatives were selected from each category by looking at the similarity of scores and patterns of students' answers

Table 3. Subject Selection List

Subject selesction list	
Category	**Subject**
High	A30
	A13
Currently	A02
	A18
	A28
Low	A21
	A31
	A03
	A07

Based on the tables above, it is known that there are 3 students who have high mathematical connection abilities, 5 students who have moderate mathematical connection abilities, and 25 students who have low mathematical connection abilities. However, because there are several criteria used by researchers in determining subjects, not all students will be described. If we look again at the table, it can be concluded that in general students have low mathematical connection abilities. The reason is that students cannot solve some questions because students forget the lesson

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material they have previously studied and students do not repeat lessons when taking tests. This shows that apart from students' low mathematical connection abilities, it also shows that students' ability to remember is still low.

Specifically, this research produces the following information: students find it easy to solve question number 1. Question number 1 contains indicators of mathematical connection ability with sciences other than mathematics, namely economics. This can happen because the level of difficulty of the questions is low. By research carried out by (Nurliza, K., 2021) where the results of the research carried out showed that 4 out of 5 students as research subjects met the indicators of ability to connect mathematics with other sciences. Also supported by the statement from (Sumarmo in Setyawati., et al, 2021) which states that mathematical connection abilities occur when individuals can connect mathematics with other fields of study or with everyday life.

Apart from questions that are easy for students to work on, some questions are difficult for students to work on, namely question number 4, which is an indicator of the ability to connect mathematics with sciences other than mathematics, namely economics, where in this question students are asked to compare banks but with a higher level of difficulty. higher than question number 1. This is the reason why there are differences in results on the same indicator. When working on this question, students often make mistakes in determining the interest rate from each bank and choosing a bank.

The results of this research are similar to the results of research carried out by (Nurul., et al, 2019) which obtained results for students who worked on questions with indicators using mathematics in other subjects with less good results. Apart from that, research conducted by (Widyawati., et al, 2020) shows that the indicator of using mathematics in other fields of science is low. This means that most students cannot relate mathematics to other fields of science.

When viewed from the indicators, there are differences in the results of solving mathematical connection questions where students can master mathematical connection indicators with other sciences. This condition can occur because each question has a different level of difficulty. Research conducted by Rina (Setyawati., et al, 2021) states that students who have different cognitive levels will produce different abilities in solving problems. This statement illustrates that questions with different levels will also produce different results.

DISSCUSION

In research conducted by Aini Zulfa (2018) with the title "Students' Mathematical Connection Ability in Solving Integer Story Problems at SMP Negeri 2 Sungai Raya," the results of the research were that there were 3 criteria for students in this research, namely low, medium and high. This is the same as the research results obtained by researchers

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where students have different abilities. By using story questions, you can encourage students to think more critically in solving problems.

Based on the background of this research, the importance of students having the ability to connect lessons is true. Apart from honing students' abilities, this ability can also make it easier for students to understand learning. So it can be concluded that students must be trained for their mathematical connection abilities.

CONCLUSION AND SUGGESTION

a) The level of students' mathematical connection abilities consists of 3 students having mathematical connections in the high category, 5 students having mathematical connections in the medium category, and 25 students having mathematical connections in the low category.
b) Students who have high mathematical connection abilities can solve test questions that contain 3 mathematical connection indicators. Although there were several errors when answering the questions.
c) Students who have moderate mathematical connection abilities tend to be able to solve problems even though there are errors in answering the questions and incomplete writing of the results of the answers.
d) Students who have low mathematical connection abilities tend not to be able to solve problems to measure mathematical connections. Some students cannot solve questions on indicators that relate mathematics to mathematical topics/concepts in mathematics. However, there tend to be more students who cannot solve questions on indicators that relate mathematics to other sciences and everyday life.

The novelty of this research is in the choice of research location, research subjects, and so on. Apart from that, researchers also obtained several findings, such as the curriculum used by students also influences students' independence in thinking, it also influences students' ability to be able to personally relate the material students study to other subject matter or students' daily lives.

SUGGESTION

As long as the researcher carried out initial observations and research at the school, the researcher could see the school's efforts to improve students' abilities, but the researcher wanted to contribute in the form of suggestions to improve students' mathematical connection abilities in the field of education. Suggestions that the author can contribute from the research results are:

1. For Teachers

Teachers are the mentors of students at school who are supposed to monitor the abilities of each student. Especially students' mathematical connection abilities, because this connection ability is one of the abilities that students must have to achieve learning.

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2. For Students

a. Students should repeat themselves and not forget the lesson material they have studied previously. Because the concepts from the previous lesson material will continue to be useful next lesson material. So it helps teachers to easily convey learning material.

b. Students should not memorize formulas or concepts but rather understand them. If students memorize, students cannot work on questions with different presentations, but if students understand the concept, students can solve questions even though they are presented in different forms.

3. For Researchers

It is hoped that this research will become a reference for future researchers who will address this topic with different material or educational levels

4. For Schools

A school is a place for students to study, schools should understand the different abilities that students have, and with an even distribution of classes, it can help students learn with each other, for example, students who have low abilities can study with students who have high abilities. This also makes students who are afraid or embarrassed to ask the teacher ask their peers.

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