



Analysis of students' mathematical connection ability based on self-confidence of class VIII junior high school students

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ABSTRACT: This research was conducted due to the fact that the level of mathematical connection ability of junior high school students was still relative low. This study aims to describe students' mathematical connection abilities based on students' self-confidence, especially in the topic of building flat sides. Self-confidence is one of the psychological aspects to see the success of learning in the school. The subjects of this study were the second grade students which is in the class VIII B as many as 25 people from SMP Negeri 3 Bangkinang. This research used a descriptive method with a qualitative approach. The instruments used in this study include a mathematical connection ability test and a self-confidence questionnaire. The stages of the research consist of 4 stages, namely: 1) filling out the self-confidence questionnaire, 2) giving mathematical connection ability test questions, 3) analyzing the data, and 4) drawing the conclusions. The results of the research has shown that: 1) Overall students' mathematical connection abilities get an average of 57%, which means that students' mathematical connection abilities are in a fairly good category, 2) Students with high self-confidence have an average mathematical connection ability of 60 %, 3) Students with moderate self-confidence have an average mathematical connection ability of 58.6%, 4) Students with low self-confidence have an average mathematical connection ability of 52.6% which is included in the poor category. Based on the results of the study, it can be concluded that students who have high self-confidence have better mathematical connection abilities rather than students who have moderate and low self-confidence.

Keywords: Analysis; Mathematical Connection Ability; Self-Confidence

Analisis kemampuan koneksi matematis siswa berdasarkan self-confidence siswa Kelas VIII Sekolah Menengah Pertama

ABSTRAK: Penelitian ini dilatarbelakangi dengan tingkat kemampuan koneksi matematis siswa SMP yang masih tergolong rendah. Penelitian ini bertujuan untuk mendeskripsikan kemampuan koneksi matematis siswa berdasarkan *self-confidence* siswa khususnya materi bangun ruang sisi datar. *Self-confidence* salah satu aspek psikologis dalam melihat berhasilnya pembelajaran di sekolah. Subyek penelitian ini kelas VIII B sebanyak 25 orang SMP Negeri 3 Bangkinang. Metode yang digunakan dalam penelitian ini yaitu metode deskriptif dengan pendekatan kualitatif. Instrumen yang digunakan dalam penelitian ini diantaranya yaitu tes kemampuan koneksi matematis dan angket *self-confidence*. Adapun tahapan penelitian yang dilakukan terdiri dari 4 tahap, yaitu: 1) pengisian angket *self-confidence*, 2) pemberian soal tes kemampuan koneksi matematis, 3) analisis data, dan 4) menarik kesimpulan. Hasil penelitian yang telah dilakukan menunjukkan bahwa: 1) Secara keseluruhan kemampuan koneksi matematis siswa memperoleh rata-rata 57%, yang berarti kemampuan koneksi matematis siswa berada dikategori cukup baik, 2) Siswa dengan *self-confidence* tinggi, rata-rata kemampuan koneksi matematisnya 60%, 3) Siswa dengan *self-confidence* sedang, rata-rata kemampuan koneksi matematisnya 58,6%, 4) Siswa dengan *self-confidence* rendah, rata-rata kemampuan koneksi matematisnya 52,6% yang termasuk

dalam kategori kurang. Berdasarkan hasil penelitian dapat disimpulkan bahwa siswa yang memiliki *self-confidence* yang tinggi kemampuan koneksi matematisnya lebih baik dibanding dengan siswa yang memiliki *self-confidence* sedang dan rendah.

Kata Kunci: Analisis; Kemampuan Koneksi Matematis; Self-Confidence

INTRODUCTION

The term of mathematical connection cannot be separated with mathematical concepts. A mathematical concept can be associated to the mathematical concept itself and also with other disciplines. By linking a concept, students are expected to be able to solve the problems that they face both in their own mathematics problems and other problems. As stated in the Brunner theory (Kumalasari & Putri, 2013) which reveals that in mathematics, every concept is related to another concept. Such as theory with theory, topic with topic, or between this branches of mathematics and other branches of mathematics (Sofiah & Nurjamil, 2019). Learning mathematics is a prerequisite for every other subject matter, every concept in mathematics is interrelated and explain other concepts (Pitriyani et al., 2018). This is called a mathematical connection.

The ability of mathematical connections help the students easily to strengthen their own concepts. Ruspiani in (Hadin et al., 2018) states that mathematical connection is the ability of students to connect mathematical concepts between mathematical concepts themselves and other fields. The importance of mathematical connection ability facilitates the students' concept understanding, the relationship between concepts and their application in solving mathematical problems. If students able to connect mathematical ideas/concepts, their level of understanding will be deeper and last for a long time because they able to see the relationship between topics in mathematics, both in the context of mathematics, and in everyday life experiences. It is agreed that there are no topics in mathematics that stand alone without any connection with other topics (Hayu et al., 2019). With the ability of mathematical connections, it is expected to expand the students' knowledge, improve their cognitive abilities as students remind and understand again the application of a concept to their environment.

Mathematical connection consists of 2 types. They are internally and externally. Internally mathematical connection is the relationship between mathematics discussion topics with other subject topics in mathematics, and externally mathematical connections is the connection of mathematics with other disciplines and everyday life (Dwirahayu & Firdausi, 2016). Research conducted by (Nurul et al., 2019) has shown that in connecting the concepts of mathematics, it showed that some students able to answer the question but they did not able to linkage between mathematics and other learning. It means that the students only master the connection internally but do not master the connection externally. Whereas, these 2 types of connection become an unavoidable unity which is contained in the indicator of mathematical connection ability.

So, it can be understood that the ability of mathematical connections is very important for the students to solve any problems that they face using the mathematical concepts that they have learned. It can be concluded that mathematical connection ability is the basic ability to apply mathematical concepts in solving problems that exist both in mathematical concepts and in the real world. Learning mathematics requires a good skills and expertise in finding solutions (Indriani et al., 2018)

In the 21st century, mathematical connection skills become one of the basic abilities that students should master, but the facts has shown that the students' mathematical connection abilities are not satisfactory. This is proofed by a research by (Azizah & Fauziyah, 2019), from the school observation, the writer found a problem such as some of the students still made mistakes on answering the questions. This happened because the students did not able to connect the mathematic concepts so that they still had difficulties in solving the questions and it is affect their achievement. The indicators that used in this research are from (Suhandri et al., 2017), they are as follows: 1) The ability of students to understand and use the connections between topics in mathematics (connections between mathematical concepts), 2) The ability of students to apply mathematics in other fields (connections of mathematics with other sciences), 3) The ability of students to apply mathematics in everyday life (the connection of mathematics with the real world). Not only cognitive abilities that need to be studied, but also affective abilities. In this case is self-confidence.

In connecting some concepts in mathematics or other fields of science, it is necessary to have the students' self-confidence in solving the mathematical problems. Andriani & Aripin, (2019) states that self-confidence is an attitude that important for every students to have. Having such a high self-confidence, help them to have high enthusiasm in completing what is the target in their assignment. Successful learning in schools is facilitated by psychological aspects related to student attitudes. One of the psychological aspects that produce a significant influence is self-confidence (Jatisunda, 2017). Building the understanding of the students based on their beliefs and abilities on their abilities is called self-confidence (Haeruman et al., 2017). In line with the statement before, (Lestari & Yudhanegara, 2017; Nurafni & Pujiastuti, 2019) states that self-confidence is an attitude or belief in one's own abilities and believes in oneself as a whole person with reference to self-concept. The indicators of self-confidence used in the study include: 1) Believe in one's own abilities, 2) Act independently in making decisions, 3) Have a positive self-concept, 4) Dare to express opinions (Lestari & Yudhanegara, 2017).

The effect of students' self-confidence on students' mathematical connection abilities has a significant effect so that students' self-confidence has a positive effect on students' mathematical connection abilities (Malinda & Minarti, 2018). It is indicates that students' mathematical connection abilities can be influenced by students' self-confidence. Based on the explanation above, it can be seen that between mathematical connection ability and self-confidence have a moderate correlation (Hendriana et al., 2014). It is in line with the statement from (Nurhayati, 2014), it is fact that the students' mathematical connection skills and self-confidence are important aspects in learning mathematics. A research by (Pitriyani et al., 2018) has shown that the mathematical connection ability of MTS students in terms of self-confidence was low. So it is important to examine the ability of mathematical connections based on self-confidence in learning mathematics. The results of research conducted by (Nurul et al., 2019) revealed that the student's self-confidence affect their learning outcomes. Someone who has good self-confidence will certainly be able to complete his tasks. This is becomes one of the reason to conduct this research about the ability of mathematical

connections based on self-confidence in SMP class VIII students. At the age of 13-14 years, students should have strong self-confidence in order to form positive thinking and the emergence of maturity in acting. Therefore, this study aims to examine the students' mathematical connection abilities based on students' self-confidence from high, medium and low, including the students' answers for each indicator of mathematical connection ability in the flat-sided geometry material equipped with a self-confidence questionnaire.

METHODOLOGY

Types of Research

This research is a descriptive research with a qualitative approach. This study describes the ability of mathematical connections based on students' self-confidence in the topic of flat-sided geometry based on whether or not the mathematical connection indicators are met based on students' self-confidence.

Research Time and Subject

This research was conducted in the even semester of the 2020/2021 academic year. The subject of this research were the second grade students which is in class VIII B as many as 25 students with 11 male students and 14 female students at SMP Negeri 3 Bangkinang.

Research Instruments

The instruments used in this study were a test of students' mathematical connection abilities and self-confidence questionnaires. Researchers compiled a self-confidence questionnaire. The questionnaire consists of positive and negative statements consisting of five categories of answer choices, namely strongly agree (SS), agree (S), sometimes (K), rarely (J), and rarely (JS). Each item is given a different weight.

Instrument of Data Collection

The instrument used in collecting data in this study consisted of a mathematical connection ability test question consisting of 5 questions and a self-confidence questionnaire sheet. In this case the researcher used a questionnaire with 25 statements, where the questionnaire was calculated using a Likert scale. The following statements has its' own value.

Data analysis technique

In analyzing the data from the students' answers, the researcher calculated it by using scoring rubric to make it easier to determine whether students' mathematical connection abilities achieve successfully or not. The rubric for scoring students' mathematical connection abilities are as follows:

Table 1. Mathematical Connection Ability Scoring Rubric

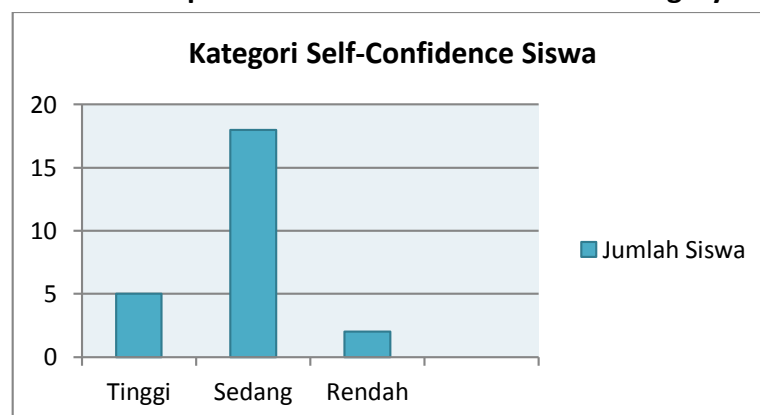
Score	Criteria
0	No answer
1	Does not show understanding of the concept at all
2	Shows the correct understanding of the concept, but it is not described in full, then the calculation is done incorrectly and the answer is not quite right.
3	Shows the correct understanding of the concept, is described in full, then the calculation is done correctly but the answer is not quite right. Or the answer shows the correct understanding of the concept, but it is not described in full, then the calculation is done correctly and the answer is correct.
4	Shows the correct understanding of the concept, is described in full, then the calculation is done correctly and the answer is correct.

Furthermore, from the test data obtained, the researcher analyzed the students' test answers based on the test guidelines in accordance with the scoring rubric that had been provided and then processed based on the student's self-confidence category and then the percentage for each question would be obtained. Then the test results from these students are grouped based on the questionnaire data obtained. Each question is formed into percentages according to the high, medium, and high group levels. Low self-confidence of students.

RESULT AND DISCUSSION

a) Categorization of Self-Confidence

The results of self-confidence categorization are obtained using a Likert scale by grouping students into three categories of students such as high, medium and low. The results can be explained in the graph 1 below:

Graph 1. Students' Self Confidence Category

The calculation result has shown that from 25 students there are 5 students with high self-confidence, 18 students with moderate self-confidence, and 2 students with low self-confidence. From the results of these calculations, a question of mathematical connection

ability is given with the aim of knowing the extent of students' mathematical connection abilities based on the category of students' self-confidence.

b) Percentage of students' Mathematical Connection Ability Test Result based on Their Self-Confidence

The test results of students' mathematical connection abilities were grouped based on the category of students' self-confidence. The percentage can be seen in table 2 below:

Table 2. Percentage of Mathematical Connection Ability Test Results

Category	Number of Question					Average
	1	2	3	4	5	
High	75%	60%	55%	65%	45%	60%
Moderate	78%	47%	57%	56%	53%	58,6%
Low	75%	50%	50%	50%	38%	52,6%
Total						57%

The overall mathematical connection ability of students is in the fairly good category, with an average of 57% (table 1). Referring to this, students with high self-confidence did not fulfill the indicator in question number 5, the connection of mathematics with the real world. Students with moderate self-confidence did not fulfill the indicators in question number 2, the connection of mathematics with other sciences and number 5, the connection of mathematics with the real world. Then the students with low self-confidence did not fulfill the indicators of the connection of mathematics with other sciences in questions number 2 and 4 as well as the connection of mathematics with the real world in questions number 3 and 5. So it can be concluded that the students who have high self-confidence have better mathematical connection abilities rather than students who have moderate and low self-confidence.

c) Analysis of Students' Mathematical Connection Ability Questions with High Self-Confidence

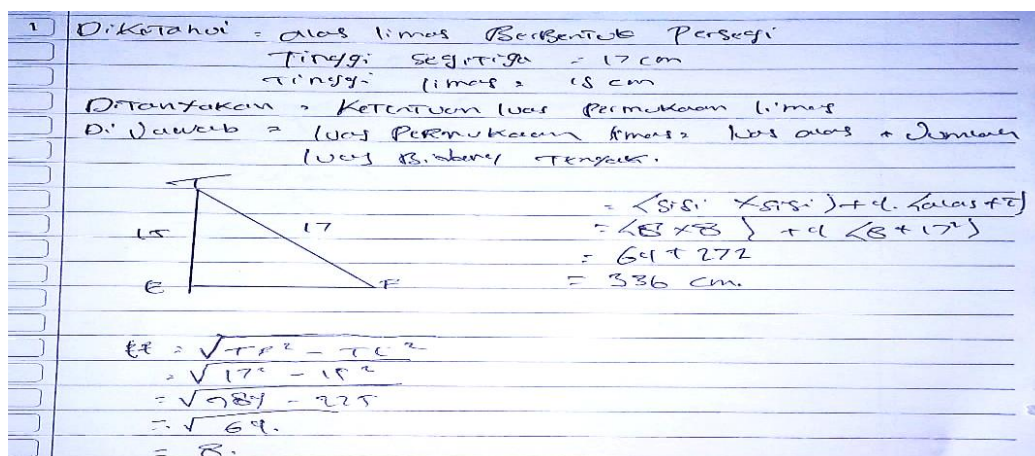


Figure 1. Students' Answer of RA Question Number 1

It can be seen from the Figure 1 above, it contains indicators of connections between mathematical concepts. The student have identified all the elements that are known completely, such as writing what is known from the problem and what is being asked. The student also able to connect the concepts in questions related to the Pythagorean theorem and describe it to make it easier to complete, but the student is less careful when carrying out the final completion process, where students directly enter the formula for the surface area of the pyramid without looking for the side length of the base of the pyramid. So the answer is wrong in determining the surface area of the pyramid. Students have a good understanding of the concept and almost correct in the mathematical process of the problem, using the correct terms and notation, but there were still errors.

d) **Analysis of Students' Mathematical Connection Ability Questions with Moderate Self-Confidence**

5. Jawab = alas (4×4) cm²
 Tinggi tenda berbentuk
 Prisma segi empat 2M
 tinggi sisi tegak bidang atap

luas permukaan prisma tanpa
 tutup
 $= (4 \times 4) + (2 \times 4) + (2 \times 4)$
 $= 16 + 8 + 8 = 32$

luas permukaan limas
 tanpa alas
 $4 \left(\frac{a \times t}{2} \right)$
 $= 4 \left(\frac{4 \times 3}{2} \right)$
 $= 4 \left(\frac{12}{2} \right)$
 $= 4 (6) = 24$

luas lain yg dibutuhkan
 $32 + 24 = 56$

Figure 2. Students' Answer of ZJ Question Number 5

It can be seen from the figure 2 above, it contains indicators mathematical connection with the real world. The student have identified all the elements that are known he/she did not write down completely everything that is mentioned in the problem such as how high the roof plane is. The Student is less careful in entering numbers in the formula for the surface area of a prism without a lid which should use the formula $=pl + 2pt + 2lt$, on the answer sheet. The student did not write the number '2' because there were opposite sides that were the same size and 1 side of the base, so the final solution was wrong. For the results of the next stage, the student's answer was correct, but in answering the question of determining the length of the fabric, the student's answer was wrong due to inaccuracy in entering numbers in the formula for the area of a prism without a base. Students have done fairly good understanding in identifying elements, less thorough in the completion process. As a result, the student is less able to relate questions in everyday life.

e) Analysis of Students; Mathematical Connection Questions with Low Self-Confidence

$$= p \times l \times t$$

$$= 100 \times 50 \times 80$$

$$= 40000$$
 volume air yang tumpah = $\frac{40000}{2} = 20000$

 volume air yg tinggal = $40000 - 20000 = 20000$

Figure 3. Students' Answer of RZ Question Number 2

It can be seen from the Figure 3 above, it contains indicators of the connection of mathematics with other sciences. The answers showed that the student did not include the known elements, he/she immediately write down the formula but there's still errors in the completion process that caused some errors in the selection of formulas. As a result, the final answer was wrong, whereas, the students have received the correct answer in the initial process, but in the process of connecting the concept with other fields of science, an error occurred in the final completion so that the student's final answer was wrong. In this case, the students did not understand how to connect mathematical concepts between other fields of science. This was affected by the lack of their self-confidence so that the answers given by students was wrong. It is in line with (Purwasih, 2015) who states that if students feel happy and confident when learning mathematics, students will be able to solve the problems given, then vice versa if students feel less confident when learning mathematics, students will experience errors in solving the problems given.

From the results of the students' answers above, it can be seen that the students who have high self-confidence are able to connect mathematical concepts both with mathematics itself, other fields and with everyday life. Meanwhile, the students who have low self-confidence are less thorough in solving problems and lack understanding in connecting mathematical concepts with other fields of science and with everyday life. So it can be understood that the higher students' self-confidence, the higher their mathematical connection abilities, and vice versa if students' self-confidence is low, the students' mathematical connection abilities are low. It is in line with a research conducted by (Pratiwi et al., 2018) who states that *self-confidence* positive effect on students' mathematics test results. Besides, there are differences answers between students who have less self-confidence and students who have good self-confidence (Pitriyani et al., 2018). Without self-confidence, students will hesitant in solving the questions given which in the end students in answering the questions given are less optimal. (Muhamad, 2016).

CONCLUSION

Students who have high self-confidence do not fulfill the indicators of students' ability to apply mathematics in everyday life (the connection of mathematics with the real world). With an average percentage of 60%, students who have a moderate self-confidence were not fulfilling the indicators of students' ability to apply mathematics in other fields (connection of mathematics with other sciences) and students' ability to apply mathematics in everyday life (connection of mathematics with the real world). With an average percentage of 58.6%, students who have a low self-confidence were not fulfilling the indicators of their ability to apply mathematics in other fields (connection of mathematics to other sciences) and their ability to apply mathematics in everyday life (connection of mathematics to the real world). With an average percentage of 52.6%, it can be concluded that students who have high self-confidence have better mathematical connection skills than students who have moderate and low self-confidence.

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