



Analysis of Mathematical Connection Ability in terms of Mathematical Resilience and Gender of MTs Students

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Abstract

This study aims to describe the Mathematical Connection Ability (MCA) in terms of Mathematical Resilience (MR) and gender of MTs students. The research method used is descriptive qualitative. This research was conducted in the even semester of the 2021/2022 academic year. The subjects in this study were class VIII MTs Al Musyarrofah Jakarta. The research instrument used was a MR questionnaire and MCA test questions which had been validated and declared suitable for use by 2 lecturers and mathematics teachers. The process of selecting subjects in this study used the Wright Maps table in the Winsteps application. The subjects selected were 5 people based on 3 categories of MR, namely high, medium, low from different genders. The results showed that students with high MCA and MR for female gender were better than boys, but on the other hand students with moderate MCA and MR and low gender. men are better than women. So the results of the study concluded that MR had an effect on the MCA but gender had no effect on the MCA of MTs students.

Keywords: Gender, Mathematical Connection Ability; Mathematical Resilience

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INTRODUCTION

Mathematics is a very important science for life so students need to have a good understanding of mathematics. However, this is not comparable to students' success in mathematics (Nabilah et al., 2019). According to Permatasari & Nuraeni (2021) the success of students still obtains good achievements because of difficulties in using formulas, understanding theory, and understanding to solve a mathematical problem. These obstacles lead to Mathematical Connection Ability (MCA) which is connected to various mathematical ideas in everyday life (Trihatun & Jailani, 2019).

According to Gunur et al. (2019) MCA is one of the many learning objectives of mathematics because it relates to other disciplines so that students can solve problems when the students' MCA is in a good category. Also stated by Sari et al. (2018) that MCA can make it easier for students to solve a mathematical problem, remember mathematical concepts, and understand mathematical concepts, and procedures but if students cannot make MCA then mathematical concepts will be forgotten, and result in students having low understanding and difficulty solving the math problem. Furthermore, according to Hadin et al. (2018) through MCA, students will have an open insight into mathematics that is not only focused on the topic being studied so that from this it will foster a positive attitude towards mathematics.

Mathematical abilities can be categorized based on several categories or levels (Pebrianti et al., 2021). In Bernard & Senjayawati (2019) research, students' MCA is in the low category, especially on the indicator of the ability to relate mathematical concepts. The results of Hamdani & Nurdin (2020) research also found that students' MCA was still very low, it could be seen from the results of the study that a score of 2,34 was obtained from the ideal score of 4. It can also be seen from the results of Dwiwandira & Tsurayya (2021) research that MCA Students' is still relatively low due to the difficulty of students in understanding mathematical concepts.

When viewed from the attitude and perception factors, it was found that there were still many students who considered mathematics a very difficult and unwelcome subject (Tambunan, 2021). According to Rahmmatiya & Miatun (2020) when solving mathematics student problems and often avoiding difficult tasks by asking the teacher or friends due to the lack of students abilities and students' lack of confidence in solving math problems, as a result, students only learn student answers that are considered clever. To overcome this problem, it is necessary to have an ability that shows an unyielding attitude and is confident in their abilities, which is called Mathematical Resilience (MR) (Kurnia et al., 2018).

MR is a quality attitude when learning mathematics such as being confident in success through hard work, showing perseverance when encountering difficulties, and having a desire to discuss, reflect and conduct research (Sugandi, 2017). There are still many students who have obstacles, difficulties, and anxiety in learning mathematics so that the effect of this results in students not liking mathematics and considering mathematics a burden that is difficult to understand, MR plays an important role to anticipate these things (Luthfiyah & Hadi, 2021; R & W, 2017; Utami & Warmi, 2019; Zanthi, 2018).

MR in students is very helpful in solving problems, this is in line with research conducted by Rahmmatiya & Miatun (2020) that students who have a good level of MR, will be more confident in solving the problems at hand. This is also reinforced by Zanthi's (2018) research which says that students who are equipped with MR will always be motivated in every learning process to achieve their academic achievements. Furthermore, Ansori (2020) research provides research findings that MR contributes positively to students' MCA.

In addition to MR, gender differences can affect students' mathematical abilities (Mentari et al., 2020). The results of Davita & Pujiastuti's (2020) research show that women are better at solving math problems than men. This can be caused by the different daily activities between men and women, therefore their abilities are different (Apriyono, 2016). On the other hand, Qadriah (2018), who discussed the effect of Contextual Teaching and Learning (CTL) learning on students' MCA based on gender, found that CTL learning did not affect High School students' MCA in terms of gender differences.

Based on several previous studies conducted by Ansori (2020) which examined the ability of MR to improve students' MCA, the results showed that there was a good influence between MR on high school students' MCA and further research by Nurfitri & Jusra (2021) who examined mathematical problem-solving abilities in terms of MR and gender found that MR affected mathematical problem-solving abilities possessed by female students and female students were superior to male students in learning mathematics. Based on the research explanation above, no research examines the MCA with MR and gender in MTs students. So that the novelty of this research is to analyze the MR and gender of MTs students' MCA. Based on this, this research is focused on "Analysis of Mathematical Connection Ability in terms of Mathematical Resilience and Gender of MTs Students."

METHOD

The type of research used is qualitative research using a descriptive approach. The descriptive method according to Tanjung & Nababan (2016) is a research method that is shown in a systematic, actual, and accurate way through sample or population data as it is to create a picture. This study describes the Mathematical Connection Ability (MCA) of

students based on Mathematical Resilience (MR) and gender.

The subjects in this study were 28 students but the focus of the research was 5 students consisting of female students and male students of class VIII MTs Al-Musyarrofah Jakarta, where the determination of research subjects was based on the results of the MR questionnaire. The instrument in this research is in the form of an MCA test question which consists of 3 essay questions, a non-test in the form of an MR questionnaire with 33 statements, and interviews conducted using structured techniques. The instrument used in this study has gone through a validation process and was declared suitable for use by 3 experts, namely 2 lecturers and a mathematics teacher. The analysis used in this study uses the Miles and Huberman model which includes data reduction, data presentation, and finally concluding.

RESULTS AND DISCUSSION

The results of the study were in the form of filling out questionnaires, working on questions, and interviews. The first data, namely the results of a Mathematical Resilience (MR) questionnaire which was analyzed using the Rasch model using Winsteps software, can be seen in the figure below.

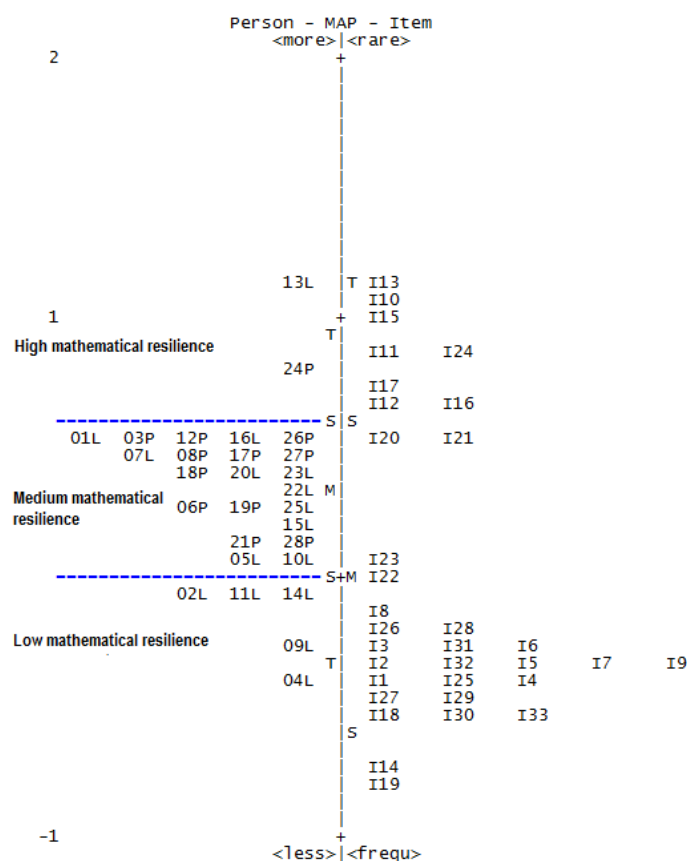


Figure 1. Wright Maps MR.

The results of the MR questionnaire in Figure 1 on the left column are given a number code showing the student number and a letter code indicating gender. Figure 1 shows that of the 28 students who filled out the MR questionnaire, the results were that 1 male student and 1 female student were in the high MR category, 10 male students and 11 female students were in the medium MR category, and 5 male students with low MR category. Based on the results of the MR questionnaire, 2 subjects were selected consisting of male and female students from each category of MR. However, in the low MR category, there were no students. Furthermore, a Mathematical Connection Ability (MCA) test was conducted on 5 students selected from each category of MR with different genders, namely S-13 and S-24 in

the high MR category, S-22 and S-28 in the medium MR category. and S-04 with a low MR category. The following are the scores from the MR questionnaire and the MCA test that have been done by 5 selected students as follows :

Table 1. The results of the MCA test scores for each question

No.	Student Code	Category Mathematical Resilience	Gender	Score			Total Score
				Mathematical Connection Ability Indicator			
				I1	I2	I3	
1.	S-13	High	L	5	4	5	14
2.	S-24	High	P	5	5	5	15
3.	S-22	Medium	L	5	0	5	10
4.	S-28	Medium	P	2	0	3	5
5.	S-04	Low	L	3	0	4	7

The results of the MCA test in the table above show that students with high MR, namely S-13 and S-24 also have superior MCA test results. Students with medium MR, namely S-22, obtained medium MCA test results, but S-28 students with moderate MR obtained poor MCA test results. Then students with low MR also get poor MCA test results.

From the data processing, it can be seen that students who have high MR have superior MCA, as well as students who have low MR, have less superior MCA. This is reinforced by the results of research conducted by Ansori (2020) that students' MR has a good effect on MCA were with high MR, students will have high motivation and be confident in their answers so that they can answer questions well and conversely with low MR have a high sense of anxiety so they cannot answer questions well. Different in terms of gender, in the high MR category female students are better than men, in the medium MR category male students are better than women and in the low MR category male students are better than female students in the category medium MR. From this analysis, it means that the results of Nurfitri & Jusra's (2021) research contradict this research, which in this study men and women have different abilities in each category of MR so gender does not affect MCA. What has been described above, shows that the MR of MTs students has a good effect on MCA, while gender does not affect MCA.

To strengthen the results of the analysis, then interviews were conducted with the 5 subjects who had high MR, medium, and low. The results of the interviews are as follows :

Subjects with high MR

① $L = \pi r^2 \rightarrow 5544 = \frac{22}{7} \times r^2$
 $\frac{5544 \times 7}{22} = r^2$
 $\frac{38.808}{22} = r^2$
 $1764 = r^2$
 $42 = r$
 Diameter = $2r = 2(42)$
 $= 84 \text{ cm}$

② - Waktu berangkat : 06.00
 Sampai : 06.50
 Lama Perjalanan : 06.50 - 06.00
 $= 50 \text{ menit}$
 - Roda berputar \times keliling lingkaran
 $= 3.500 \times \pi \times d$
 $= 3.500 \times \frac{22}{7} \times 0,63$
 $= 6930$
 kecepatan =

③ L. Persegi = 4×5
 $= 15 \times 15$
 $= 225 \text{ cm}^2$
 - Daerah yang tidak diarsir
 $L \frac{1}{2}$ lingkaran = $\frac{1}{2} \times \pi \times r^2$
 $= \frac{1}{2} \times 3,14 \times 7,5 \times 7,5$
 $= 88,31 \text{ cm}^2$
 L. segitiga = $\frac{1}{2} \times a \times l$
 $= \frac{1}{2} \times 15 \times 7,5$
 $= 56,25 \text{ cm}^2$
 L. daerah yang diarsir = $225 - 88,31 - 56,25$
 $= 80,44 \text{ cm}^2$

Figure 2. Answer S-13 about MCA

Researcher : You answered almost all the questions, are you sure about your answers?

Subject (S-13) : Yes I'm sure

Researcher : What makes you sure about your answer?

- Subject (S-13) : Because I work on the questions according to what the teacher has taught
- Researcher : If you are sure of your answer, are you confident and able to explain in front of the class the questions and solutions you have worked on?
- Subject (S-13) : Yes, I am confident and able to explain the problem and its solution which I really understand and understand
- Researcher : In question number 2 you haven't finished it yet, why?
- Subject (S-13) : I forgot the speed formula
- Researcher : Do you know what this question is related to?
- Subject (S-13) : I know, related to Physics lessons because it calculates speed
- Researcher : Do you think math is important or not?
- Subject (S-13) : Important, because in everyday life there is also mathematics

Subjects with student code S-13 are male students who have high MR. From Figure 2, S-13 did almost all the questions answered but there is 1 question that has not been completed, namely on indicators of the application of mathematical concepts in other fields of science. In the results of the S-13 interview, he explained that he had forgotten the speed formula but he understood that the problem was related to another field, namely Physics and he also explained that mathematics exists in everyday life. In the results of the interview, it was also found that S-13 had good MR which he believed in the answer.

<p>1. Dik: luas kain taplak majo 5.544 cm² Ditanya: diameter majo?</p> <p>Luas: $\pi \cdot r^2$ 5.544 = $22 \cdot r^2$ $r^2 = \frac{5.544 \times 7}{22}$ $r^2 = 1.764 \times 2$ $r = \sqrt{1.764}$ $r = 42 \text{ cm}$ $d = r(2)$ $d = 42(2)$ $d = 84 \text{ cm}$</p>	<p>2. Dik: berangkat: 06.00 Sampai: 06.50 diameter: 0,68 m $n = 8.500$</p> <p>Jarak = $n \times \text{keliling lingkaran}$ $= 8.500 \times \frac{22}{7} \times 0,68$ $= 6.930 \text{ m} = 6,93 \text{ km}$ waktu = 06.50 $\frac{06.00}{50 \text{ menit}}$ kecepatan: Jarak : waktu $= 6,93 : 50$ $= 0,1386 \text{ km/menit}$</p>	<p>3. L. □ = $s \times s$ $= 15 \times 15$ $= 225$ $L \cdot \frac{1}{2} O = \pi \cdot r^2 : \frac{1}{2}$ $= 3,14 \times 7,5 \times 7,5 \times \frac{1}{2}$ $= 88,5125$ $L \cdot D = \frac{1}{2} \times a \times t$ $= \frac{1}{2} \times 15 \times 7,5$ $= 56,25$ Luas daerah yg diarsir $= L \cdot \text{persegi} - L \cdot \frac{1}{2} \text{ lingkaran} - L \cdot \text{segitiga}$ $= 225 - 88,5125 - 56,25$ $= 80,2375$</p>
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Figure 3. Answer S-24 about MCA

- Researcher : You answered all the questions, are you sure about your answers?
- Subject (S-24) : Yes sure
- Researcher : What makes you sure about your answer?
- Subject (S-24) : Because I do well and earnestly according to my ability
- Researcher : If you are sure of your answer, are you confident and able to explain in front of the class the questions and solutions you have worked on?
- Subject (S-24) : Yes I am confident and can explain it
- Researcher : In question number 2, what is it related to?
- Subject (S-24) : In question number 2 asked speed means it is related to Physics
- Researcher : Do you think math is important or not?
- Subject (S-24) : It is very important, because in our daily life there is also mathematics in it

Subjects with the student code S-24 are female students who have high MR. From Figure 3, S-24 did all the questions correctly. The results of the interview also obtained that S-24 has very good MR.

From the results of the analysis of the two subjects in the high MR category, it was found that female students were superior to boys, but the difference was only slightly where male students were less than perfect in the MCA indicator linking mathematics in their field due to forgetting the speed formula but he knew this question relates to other fields. This is

following the research conducted by Aliyah et al., (2019) which found that female students got better test scores than boys. Eliza (2020) also revealed that men are better at reasoning, relying only on their memory, and lacking in literacy while women are better at learning styles where women are more diligent, thorough, and careful in learning and like to read, this is what makes women more attractive. better than men.

Subjects with medium MR

1. Luas = $5544 \text{ cm}^2 = \frac{22}{7} \times r^2$
 $r^2 = \frac{22}{7} \times 5544 \text{ cm}^2$
 $r^2 = 5544 \text{ cm}^2 \times \frac{7}{22}$
 $r^2 = 1764$
 $r = \sqrt{1764}$
 $r = 42 \text{ cm}$
 diameter = $r \times 2$
 $= 42 \times 2$
 $= 84 \text{ cm}$

2. - L.P = 5×5
 $= 15 \times 15$
 $= 225 \text{ cm}^2$
 • L $\frac{1}{2}$ lingkaran = $\frac{1}{2} \pi r^2$
 $= \frac{1}{2} \times 3,14 \times r^2$
 $= \frac{1}{2} \times 3,14 \times 7,5 \times 7,5$
 $= 88,31 \text{ cm}^2$
 • L segitiga = $\frac{1}{2} \times a \times t$
 $= \frac{1}{2} \times 15 \times 7,5$
 $= 56,25 \text{ cm}^2$

• Luas daerah yang diarsir
 $= \text{L Persegi} - \text{L } \frac{1}{2} \text{ lingkaran} - \text{L segitiga}$
 $= 225 - 88,31 - 56,25$
 $= 80,44 \text{ cm}^2$

Figure 4. Answers S-22 about MCA

Researcher : You answered questions number 1 and 3, are you sure about your answer?

Subject (S-22) : Yes I'm sure

Researcher : What makes you sure about your answer?

Subject (S-22) : This question has been studied before

Researcher : If you are sure of your answer, are you confident and able to explain in front of the class the questions and solutions you have worked on?

Subject (S-22) : Yes, I can and believe in myself

Researcher : Do you know what question number 2 is related to?

Subject (S-22) : I know, with Physics lessons

Researcher : Do you think math is important or not?

Subject (S-22) : Important, because mathematics is in our daily life

Subjects with student code S-22 are male students who have medium MR. From Figure 4, in the 3 questions given only question number 2 with indicators of the application of mathematical concepts in other fields of science he did not answer the question but knew that the question was related to other fields of science. As for the results of the interview, S-22 has a fairly good MR.

1. Luas meja = πr^2
 $5544 = \frac{22}{7} \times r^2$
 $r^2 = \frac{22}{7} \times 5544 \times \frac{7}{22}$
 $r^2 = 1764$
 $r = \sqrt{1764}$
 $r = 42$

3. diketahui
 3 bangun datar
 - Persegi
 - $\frac{1}{2}$ lingkaran
 - segitiga
 - Luas Persegi = 5×5
 $= 15 \times 15$
 $= 225 \text{ cm}^2$
 - Luas $\frac{1}{2}$ lingkaran = $\frac{1}{2} \times \pi \times r^2$
 $= \frac{1}{2} \times 3,14 \times 7,5 \times 7,5$
 $= 88,31$
 - Luas segitiga = $\frac{1}{2} \times a \times t$
 $= \frac{1}{2} \times 15 \times 7,5$
 $= 56,25$

Figure 5. Answers S-28 about MCA

Researcher : Are you sure about your answer?

Subject (S-28) : I'm not sure

- Researcher : Explain what makes you unsure?
- Subject (S-28) : Because I haven't finished the answers to numbers 1 and 3. In question number 1, I don't understand the process and in question number 3, I don't master calculations using pi with 3,14
- Researcher : If you are asked to explain the solution to a problem, are you confident and able to explain in front of the class the problem and the solution of the problem?
- Subject (S-28) : I am not confident because my ability is still lacking
- Researcher : Do you know what question number 2 relates to?
- Subject (S-28) : I don't know
- Researcher : Do you think math is important or not?
- Subject (S-28) : Important, because mathematics can be used in everyday life

Subjects with the student code S-28 are female students who have medium MR. From Figure 5, it can be seen that S-28 did not solve the problem perfectly as seen in the completion of question number 1, S-28 was not completely correct in the process and in number 3, S-28 could not solve the problem perfectly and at number 2 for indicators the application of mathematical concepts to other fields of science she did not work on and did not know what was related to the question. From the results of the interview, it was also found that the S-28 MR was not good because the students did not feel confident about themselves.

From the 2 subjects on moderate MR that have been analyzed, it can be concluded that male students are better than girls. This is following the research of Rahmawati et al.,(2022) which says that male students can be better than women in certain aspects of mathematical ability because although women are better in affective aspects, men have high mathematical abilities.

Subjects with low MR

Figure 6. Answers S-04 about MCA

- Researcher : Are you sure about your answer?
- Subject (S-04) : I am not sure about my answer
- Researcher : What makes you unsure of your answer?
- Subject (S-04) : I don't understand how to solve the 3 questions
- Researcher : If you are asked to explain the solution of a problem, are you confident and able to explain in front of the class the problem and the solution of the problem?
- Subject (S-04) : I am unable and not confident
- Researcher : Do you know what question number 2 is related to?
- Subject (S-04) : I don't know
- Researcher : Do you think math is important or not?
- Subject (S-04) : Important, because mathematics is always used in everyday life but

mathematics is very difficult

Subjects with the student code S-04 are male students who have a low MR category. From Figure 6, S-04 is not able to do the questions correctly. In question number 1, students do not understand how the process is carried out and in question number 3, students are less precise in calculations and not perfect in solving problems, and are unable to relate mathematics to other fields of science because he did not work on question number 2 and he also did not know what the question was related to. The results of the interview showed that students did not understand the questions given and felt insecure and considered mathematics to be difficult. This is following research by (Farida et al., 2019) which found that students with low self-confidence will have an impact on student motivation in learning so that students' MCA is low. Azizah & Abadi (2022) also said that MR affects student learning outcomes and mathematical abilities, which means that MR is important for students.

CONCLUSION

Based on the results of the study, all students were sufficient in the Mathematical Connection Ability (MCA), students were able to relate mathematics in everyday life and on other mathematics topics but were lacking in indicators relating to mathematics in other fields of science and with Mathematical Resilience (RM) that students possessed. Well, it will also have a good effect on MCA, but gender does not affect MTs students' abilities. This can be seen from the data analysis carried out, for students with high MCA and MR in the female gender, which is superior to the male gender, but on the other hand, students who have the MCA and MR are medium and low in the male gender superior to women.

RECOMMENDATION

The results of this study are expected to be an effort to improve the quality of mathematics learning and are expected to be one of the reference materials for further research related to Mathematical Connection Ability (MCA) with a wider subject.

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