SJME (Supremum Journal of Mathematics Education)
Vol.08, No.01, January 2024, pp. 115-128
ISSN: 2548-8163 (online)| ISSN: 2549-3639 (print)
DOI: 10.35706/sjme.v8i1.10481

Meta-Analysis: The Effect of Mathematical Resilience to Mathematical Problem Solving Ability

Nova Tania[1], Scolastika Mariani[2], Arief Agoestanto[3] and Bambang Eko Susilo[4]
[1,2,3,4] Universitas Negeri Semarang, Semarang, Indonesia
Email: nova0129tania@students.unnes.ac.id[1] , mariani.mat@mail.unnes.ac.id[2] , arief.mat@mail.unnes.ac.id[3] , bambang.mat@mail.unnes.ac.id[4]

Article Information

Received December 05, 2023
Revised December 29, 2023
Accepted Januari 15, 2024

Diterima 05 Desember 2023
Direvisi 29 Desember 2023
Disetujui 15 Januari 2024

Keywords: Meta Analysis, Mathematical Resilience, Mathematical Problem Solving Ability

Kata Kunci: Meta Analisis, Resiliensi Matematis, Kemampuan Pemecahan Masalah Matematis

ABSTRACT

The aim of this research is to analyze the effect of mathematical resilience to mathematical problem solving abilities based on relevant articles. This research method uses meta analysis using OLS (Ordinary Least Square) to determine a simple linear regression equation and also using formula effect size to determine the measure of effect. The results of this research are that mathematical resilience has a positive effect to mathematical problem solving abilities of 44.488% with a simple linear regression equation, namely $Y = 8.2488 + 0.6426X$. The effect of mathematical resilience to mathematical problem solving ability is large, with average of effect size is 0.764. So, its conclude that mathematical resilience had positive large effect to mathematical problem solving ability.

ABSTRAK

Tujuan penelitian untuk menganalisis pengaruh resiliensi matematis terhadap kemampuan pemecahan masalah matematis berdasarkan artikel yang relevan. Metode penelitian ini menggunakan meta analisis menggunakan OLS (*Ordinary Least Square*) untuk menentukan persamaan regresi linier sederhana dan juga menggunakan rumus *effect size* untuk menentukan besarnya pengaruh. Hasil penelitian ini adalah resiliensi matematis berpengaruh positif terhadap kemampuan pemecahan masalah matematis sebesar 44,488% dengan persamaan regresi linier sederhana yaitu $Y = 8{,}2488 + 0{,}6426X$. Pengaruh resiliensi matematis terhadap kemampuan pemecahan masalah matematis besar, dengan rata-rata *effect size* sebesar 0,764. Dengan demikian dapat disimpulkan bahwa resiliensi matematis mempunyai pengaruh positif yang besar terhadap kemampuan pemecahan masalah matematis.

INTRODUCTION

Mathematical problem solving ability is an ability that students must have (NCTM, 2000; Wagner, 2010). According to Torio (2015), one of the goals in learning mathematics is to make students become effective problem solvers. In fact, according to Branca (1980), problem solving ability is the heart of mathematics. Problem solving abilities are the core of mathematics learning activities (Priatna et al., 2022). According to Krulik & Rudnick (1995), problem solving abilities are a means for individuals to use previously possessed knowledge and abilities to synthesize and apply to new and different situations. Problem solving abilities play a role in the thinking process, to find a way out to achieve a goal (Satya et al., 2022).

Problem solving is a strategic competency demonstrated through understanding, choosing approaches, solving strategies, and completing models to solve problems (Bernard et al., 2018). Problem solving abilities include high-level thinking abilities in solving non-routine problems, dynamic thinking and reconstructing previously acquired knowledge (Kania & Arifin, 2019). So mathematical problem solving abilities are important for students to have.

Indicators of mathematical problem solving abilities according to Polya (1973), include (1) understanding the problem: stating the information provided, stating the problem that must be solved, drawing sketches related to the problem if necessary; (2) make a plan: state the problem solving strategy/method that will be used, write down the formula that will be used; (3) carrying out the plan: solving problems according to previously written strategies and formulas, stating the solution to the given problem; and (4) rechecking: stating how the process of rechecking the process and the solutions obtained.

According to Hewi & Shaleh (2020), the 2018 PISA results show that Indonesia in mathematical ability has an average score of 379, ranking 73rd out of 79 countries. It can be said that Indonesian students' mathematical problem solving abilities are very low, being the country number 7 from the bottom. This is based on the opinion of Wahyuni & Masriyah (2021), that PISA measures more problem-solving abilities in real-world contexts.

In solving a mathematical problem students must have a positive attitude. According to Sumarmo (2015), a positive attitude which includes values, fighting power, perseverance, tenacity and not giving up when facing difficulties in learning mathematics is called mathematical resilience. According Inayah & Agoestanto (2023), mathematical resilience includes hard work, language skills, self-confidence and perseverance in overcoming challenges and obstacles in solving mathematical problems. According to Johnston-Wilder & Lee (2010), mathematical resilience is a quality attitude in learning mathematics which includes confidence in one's success through hard work, showing perseverance in facing difficulties, a desire to discuss, reflect and research. So mathematical resilience is a positive attitude that students must have in solving mathematical problems.

Indicators of mathematical resilience according to Sumarmo (2015), include (i) showing an attitude of perseverance, self-confidence, working hard and not giving up easily in the face of problems, failure and uncertainty; (ii) show a desire to socialize, easily provide help, discuss with their peers, and adapt to their environment; (iii) generating new ideas/methods and finding creative solutions to challenges; (iv) using failure experiences to build self-motivation; (v) have curiosity, reflect, research, and utilize various sources; and (vi) have language skills, self-control, and are aware of their feelings.

Something in mathematics becomes a problem if it is something new or unfamiliar that students cannot immediately solve. So to (3) solve a mathematical problem according to the plan that has been prepared, (i) students must show an attitude of perseverance, self-confidence, working hard and not give up easily in the face of problems, failure and uncertainty. If the plan failed, students must (iv) use the experience of failure to build self-motivation. Not only that, students must (ii) show a desire to socialize, easily provide help, discuss with their peers, and adapt to their environment to (iii) generate new ideas/methods and find creative solutions to challenges. In addition, to plan new strategies, students need to (v) have curiosity, reflect, research, and utilize various sources to (2) plan strategies and formulas that will be used to solve mathematical problems. Apart from that, (vi) language skills, self-control, and being aware of one's feelings will also have an impact on the ability to (1) understand problems and (4) rechecking. With good language skills, students will be able to express the information provided and the problems that must be solved well. The

ability to control themselves will also make students not quickly satisfied with the results obtained so they will rechecking their work.

The effect of mathematical resilience to the ability to solve mathematical problems quantitatively has been widely researched. This research was conducted by Budiastuti & Supardi (2020), Attami et al. (2020), Fatimah et al. (2021), Cahyaningsih et al. (2021), Lutfiyana et al. (2022), Yuniar et al. (2022), Kuncoro & Juandi (2023), Fitriani et al. (2023), Olo et al. (2023), and Arjun & Muntazhimah (2023). However, this research only focuses on certain levels of education such as elementary, middle and high school. So researchers want to conduct a literature study on the results of these studies to determine the effect of mathematical resilience to mathematical problem solving abilities at all levels of education. So the title of this research is "Meta-Analysis: The Effect of Mathematical Resilience to Mathematical Problem Solving Ability". The aim of this research to analyze the effect of mathematical resilience to mathematical problem solving abilities.

METHOD

The research method used is the meta analysis. The meta-analysis method is used to summarize and obtain the essence of previous quantitative research results (Retnawati et al., 2018). Article searches were carried out through online journals on Google Scholar. The keywords used are (1) mathematical resilience and mathematical problem solving ability; (2) the effect of mathematical resilience to mathematical problem solving ability; (3) *resiliensi matematis dan kemampuan pemecahan masalah matematika*; (4) *pengaruh resiliensi matematis terhadap kemampuan pemecahan masalah matematis*. From the search results using these keywords, several articles were obtained. Then the articles were filtered to obtain several articles which contained a simple linear regression equation between mathematical resilience and mathematical problem solving abilities. Not only that, the selected articles also included elementary school, junior high school and high school students as research samples.

The data analysis technique in this research uses OLS (Ordinary Least Square) to determine a simple linear regression equation so that the effect of mathematical resilience to mathematical problem solving abilities is known. The formula used is as follows (Sukestiyarno, 2021).

$$Y = a + bX \text{ with}$$

$$a = \frac{\sum X_i^{\,2} \sum Y_i - \sum X_i Y_i \sum X_i}{n \sum X_i^{\,2} - (\sum X_i)^2}$$

$$b = \frac{n \sum X_i Y_i - \sum X_i \sum Y_i}{n \sum X_i^{\,2} - (\sum X_i)^2}$$

Meanwhile, the formula for determining the effect size on correlation is according to Cooper et al. (2009) is as follow.

$$ES = 0.5 \times \ln\left(\frac{1+r}{1-r}\right)$$

Note:

ES : effect size

r : correlation coefficient

The results of the Effect Size calculation are interpreted based on the following categories Cooper et al. (2009) is as follow in Table 1.

Table 1. Interpretation of Effect Size

Effect Size	Category
$0.1 \leq ES < 0.3$	Small effect
$0.3 \leq ES < 0.5$	Medium effect
$5 \leq ES$	Large effect

FINDINGS AND DISCUSSION

After searching for articles related to the relationship between mathematical resilience and mathematical problem solving abilities according to keywords published from 2018 until 2023, there were 9 articles. The results of the analysis of the ten articles are shown in Table 2.

Table 2. Research on the Effect of Mathematical Resilience to Mathematical Problem Solving Ability

Code	Title	Keywords	Sample	Finding	Source
A1	*Analisis hubungan resiliensi matematik terhadap kemampuan pemecahan masalah siswa pada materi lingkaran*	Problem solving ability, mathematical resilience	There are 34 students at class VIII MTs Negeri Kota Cimahi.	There is a significant relationship between mathematical resilience to mathematical problem solving abilities. The value of correlation coefficient is 0.649.	Maharani & Bernard (2018)
A2	*Hubungan resiliensi matematis terhadap kemampuan pemecahan masalah matematis mahasiswa pada mata kuliah matematika dasar*	Mathematical resilience, mathematical problem solving ability	There are 35 students of the Computer and Informatics Engineering study program at SKIP AL Maksum Langkat	There is a significant effect of mathematical resilience to students' mathematical problem solving abilities of 41.3%. The value of correlation coefficient is 0.643. The level of relationship between mathematical resilience and mathematical problem solving ability is moderate.	Fatimah et al. (2021)
A3	*Pengaruh kemandirian belajar dan resiliensi*	Learning independence, mathemati	There are 48 students at class VIII	There is a significant effect of mathematical resilience to students'	Lutfiyana et al. (2022)

Code	Title	Keywords	Sample	Finding	Source
	matematis terhadap kemampuan pemecahan masalah matematis siswa	cal resilience, mathemati cal problem solving ability	Junior High School of Manbaul Hikmah.	mathematical problem solving abilities of 23.62%. The value of correlation coefficient between mathematical resilience and mathematical problem solving ability is 0.486. The simple linear regression equation between mathematical resilience (X) and students' mathematical problem solving abilities (Y) is $Y = 23.881 + 0.536X$.	
A4	*Pengaruh minat belajar dan resiliensi matematis terhadap kemampuan pemecahan masalah matematis siswa*	Interest to learn, mathemati cal resilience, mathemati cal problem solving skills	There are 291 students at class VII Junior High School in Kebasen District.	There is a significant effect of mathematical resilience to students' mathematical problem solving abilities of 25.7%. The value of correlation coefficient between mathematical resilience and mathematical problem solving ability is 0.634.	Maulin a et al. (2022)
A5	*Hubungan antara resiliensi matematis dan kemampuan pemecahan masalah matematika siswa di sekolah dasar*	Correlation , mathemati cal resilience, mathemati cal problem solving ability	There are 100 students at class V Elementar y School of Klender Village, Duren Sawit	There is a positive and significant effect of mathematical resilience to mathematical problem solving abilities of 37.09%. The value of correlation coefficient is 0.609. The simple linear	Yuniar et al. (2022)

Code	Title	Keywords	Sample	Finding	Source
			District, East Jakarta.	regression equation between mathematical resilience (X) and students' mathematical problem solving abilities (Y) is $Y = -8.499 + 0.3651X$.	
A6	The effect of module-assisted direct instruction on problem-solving ability based on mathematical resilience	Direct instruction, problem-solving ability, mathematical resilience	There are 40 prospective teacher students at a private university in Yogyakarta.	Mathematical resilience has an effect of 30.1% to mathematical problem solving ability. The value of correlation coefficient is 0.548.	Kuncoro & Juandi (2023)
A7	Considering the mathematical resilience in analyzing students' problem solving ability through learning model experimentation	Mathematical ability, mathematical resilience, problem-solving, ability problem-solving, learning model	There are 233 students at class VII Junior High School in Langsa City, Aceh.	There is a significant effect between mathematical resilience to mathematical problem solving abilities of 79.80%. The value of correlation coefficient is 0.444. The simple linear regression equation between mathematical resilience (X) and students' mathematical problem solving abilities (Y) is $Y = 65.066 + 0.444X$.	Fitriani et al. (2023)
A8	*Pengaruh resiliensi matematis terhadap keterampilan penyelesaian*	*Kemampuan pemecahan masalah, pengaruh,*	There are 50 students at class VIII one of the junior high	There is a significant effect of mathematical resilience to students' problem solving abilities of 85%. The	Olo et al. (2023)

Code	Title	Keywords	Sample	Finding	Source
	masalah peserta didik kelas VIII sekolah menengah pertama	*resiliensi matematis*	schools in North Central Timor Regency.	value of correlation coefficient is 0.922. The simple linear regression equation between mathematical resilience (X) and students' mathematical problem solving abilities (Y) is $Y = 8.677 + 0.916X$.	
A9	The effect of mathematical resilience on the mathematical problem-solving ability of students	Mathematical problem solving, mathematical resilience	There are 67 students at class XI-Social at Senior High School of 106 Jakarta.	There is a significant effect of mathematical resilience to mathematical problem solving abilities of 33.30%. The value of correlation coefficient is 0.577. The simple linear regression equation between mathematical resilience (X) and students' mathematical problem solving abilities (Y) is $Y = -3.741 + 0.352X$.	Arjun & Muntazhimah (2023)

Of the nine articles, articles were selected that contained a simple linear regression equation between mathematical resilience (X) and mathematical problem solving abilities (Y). So five articles were obtained consisting of A3, A5, A7, A8 and A9. The simple linear regression equation graph for each article is shown in Figure 1.

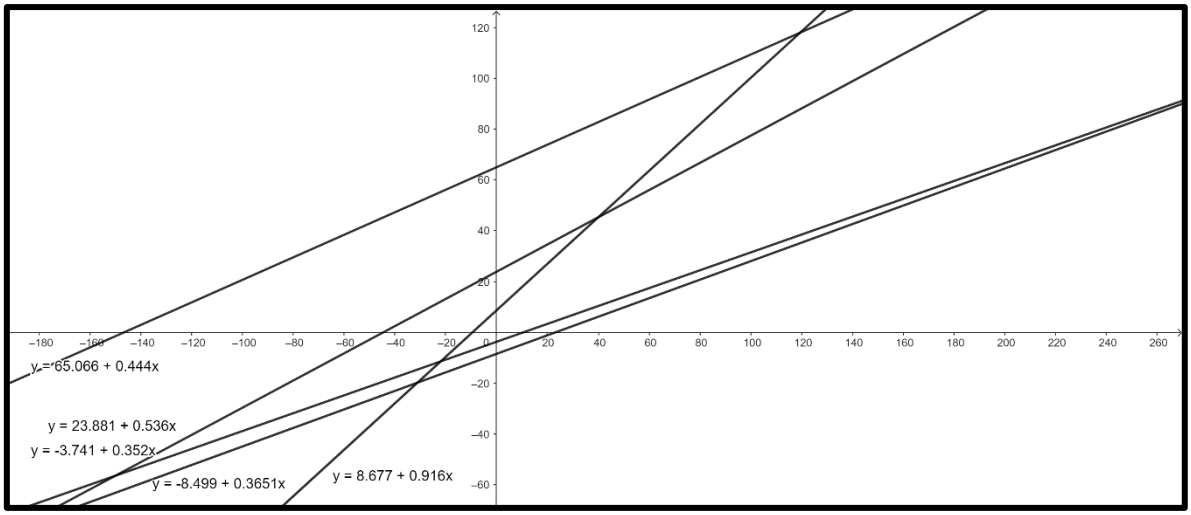

Figure 1. Simple Linear Regression Equation on A3, A5, A7, A8, A9

From the simple linear regression equation above, 7 points were selected that fulfilled each regression equation. So that mathematical problem solving ability data (Y) and mathematical resilience data (X) are obtained in Table 3.

Table 3. Data of Mathematical Problem Solving Ability (Y) and Mathematical Resilience (X)

Code	Simple linear regression equation	Point (X, Y)
A3	$Y = 23.881 + 0.536X$	$(98, 76); (96, 75); (92, 73); (89, 72); (88, 71); (87, 71); (84; 69)$
A5	$Y = -8.499 + 0.3651X$	$(60, 13); (70, 17); (65, 15); (65, 15); (84, 22); (75, 19); (62, 14)$
A7	$Y = 65.066 + 0.444X$	$(72, 97); (65, 94); (70, 96); (75, 98); (78, 100); (62, 93); (74, 98)$
A8	$Y = 8.677 + 0.916X$	$(80, 82); (90, 91); (88, 89); (75, 77); (77, 79); (82, 84); (86, 87)$
A9	$Y = -3.741 + 0.352X$	$(80, 24); (74, 22); (95, 30); (88, 27); (87, 27); (60, 17); (92, 29)$

From these data, the values obtained are $\sum X_i = 2765$, $\sum Y_i = 2066$, $\sum X_i Y_i = 165844$, $\sum {X_i}^2 = 222583$, and $(\sum X_i)^2 = 7645225$ for $n = 35$. Hence:

$$a = \frac{(222583)(2066) - (165844)(2765)}{(35)(222583) - (7645225)} = 8{,}2488$$

$$b = \frac{(35)(165844) - (2765)(2066)}{(35)(222583) - (7645225)} = 0{,}6426$$

So the simple linear regression equation obtained is $Y = 8.2488 + 0.6426X$. This means that if mathematical resilience (X) is 0, the mathematical problem solving ability score (Y) is 8.2488 and if there is an increase in mathematical resilience by 1 point, the mathematical problem solving ability will increase by 0.6426. Meanwhile, the average of the effect of mathematical resilience to mathematical problem solving abilities from A2, A3,

A4, A5, A6, A7, A8, and A9 is 44.488%. The simple linear regression equation shown in Figure 2.

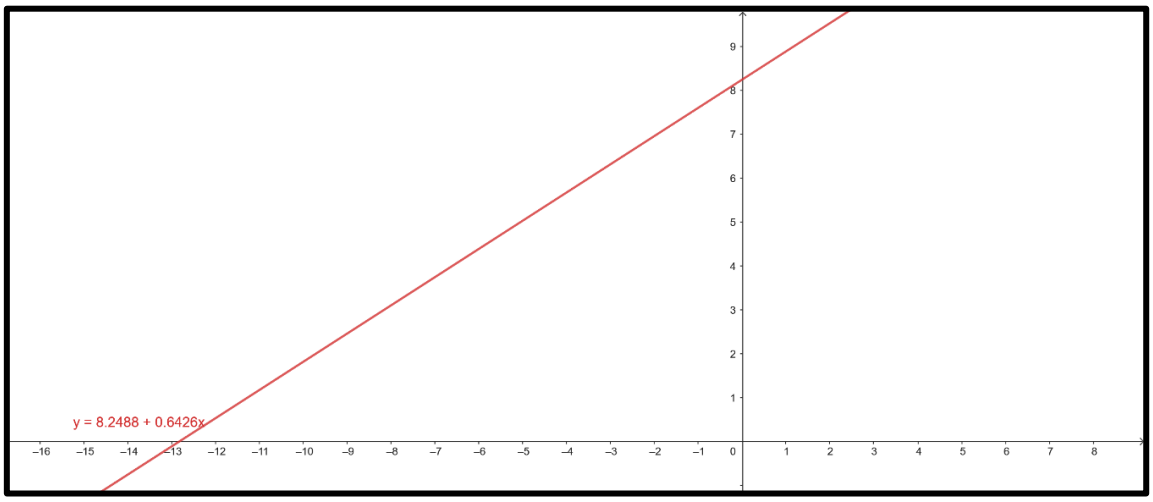

Figure 2. Simple Linear Regression Equation

Meanwhile, the results of the effect size analysis show that the nine articles analyzed all have a large effect category between mathematical resilience on mathematical problem solving abilities with the everage of effect size is 0.764. In detail, the calculation results of effect size are contained in Table 4.

Table 4. Calculation of Effect Size

Code	r	ES	Category
A1	0.649	0.773	Large effect
A2	0.643	0.763	Large effect
A3	0.486	0.530	Large effect
A4	0.634	0.748	Large effect
A5	0.609	0.707	Large effect
A6	0.548	0.615	Large effect
A7	0.444	0.477	Large effect
A8	0.922	1.602	Large effect
A9	0.577	0.657	Large effect

Based on the findings, it was found that the simple linear regression equation was $Y = 8.2488 + 0.6426X$ with the average of the effect of mathematical resilience to mathematical problem solving abilities is 44.488%. Meanwhile, the results of the effect size analysis show that the nine articles analyzed all have a large effect category between mathematical resilience on mathematical problem solving abilities with the everage of effect size is 0.764. This shows that there is a large effect between mathematical resilience to mathematical problem solving abilities. This is in line with the results of research by 'Athiyah et al. (2020) and Budiastuti & Supardi (2020), that mathematical resilience has a significant positive effect on mathematical problem solving abilities. According to 'Athiyah et al. (2020), students with high mathematical resilience tend to be better at solving problems which can be seen from the interpretation of problems and appropriate solving strategies even though there are students who are less careful in carrying out calculations. According

to Rahmatiya & Miatun (2020), students who have high resilience have good mathematical problem solving abilities and are confident when facing mathematical problems. Students who have high resilience do not give up easily when experiencing difficulties and are able to fulfill all Polya problem solving steps (Harahap & Manurung, 2022; Nurfitri & Jusra, 2021). Students who have high mathematical resilience are likely to be better at solving the problems given, this can be seen from the correct solving technique even though the final answer is not correct (Arjun & Muntazhimah, 2023). So the higher the student's mathematical resilience, the higher their mathematical problem solving ability.

According to Yuniar et al. (2022), students with high mathematical resilience are able to manage their emotions well, making it possible to represent problems, look for solution strategies, implement problem solving strategies so that students can solve mathematical problems well. According to Lutfiyana et al. (2022), students with good mathematical resilience will not give up easily if they experience difficulties and believe in their abilities when learning mathematics, so that students obtain optimal learning outcomes. Students who have high mathematical resilience do not give up easily and always try to face difficulties in mathematics, always have an open attitude, are confident and always have the enthusiasm to succeed (Rohmah et al., 2020). According to Fitriani et al. (2023), students who have positive resilience usually do not give up easily when facing problems, while students who have negative resilience are characterized by feelings of anxiety, avoidance of problems, negative thought patterns, and helplessness or difficulty in solving these problems. According to Cahyaningsih et al. (2021), students who have high mathematical resilience have good self-control so they are able to avoid mathematics anxiety and thus obtain better results in solving non-routine problems. Students who have high mathematical resilience are able to face challenges and negative situations in solving problems because they are able to train themselves (Attami et al., 2020). According to Fatimah et al. (2021), someone who has high resilience must have self-confidence, no matter how difficult the problem they face, they will try to find a solution, whether through their own knowledge or through the help of others. According to Nahdi (2020), students who have high self-mathematical resilience will try to increase their own potential so that they can adapt to the mathematical problems they face so that they do not view problems as a burden, but instead view them as a stepping stone to develop themselves. Students who have strong mathematical resilience, have an adaptive attitude or can adjust to the environment; can face uncertainty, challenging problems; solve problems logically and flexibly; seek creative solutions to challenges; be curious and learn from experience; have the ability to control oneself; aware of his feelings; have a strong and easy social network (Johnston-Wilder & Lee, 2010). So it can be concluded that students who have high mathematical resilience have high self-confidence, do not feel worried about failing and do not give up easily so they can solve mathematical problems well.

Students who have moderate resilience are less able to solve problems according to plan but do not give up when experiencing difficulties (Nurfitri & Jusra, 2021). Students who have moderate mathematical resilience are only able to fulfill two steps of solving Polya problems (Harahap & Manurung, 2022). According to ’Athiyah et al. (2020), students who have moderate resilience have worse problem solving abilities than students who have high resilience because students who have moderate resilience are not able to determine the right strategy and draw conclusions from solving problems. According to Rahmatiya & Miatun (2020), students who have moderate resilience still lack mathematical problem solving abilities, because they have not been able to achieve systematic steps in mathematical problem solving abilities, are less thorough, and tend to give up when faced with difficult

problems. So it can be concluded that students who have moderate mathematical resilience are less able to solve mathematical problems because they sometimes give up easily when they encounter difficulties.

Students with high mathematical resilience have better mathematical problem solving abilities than students with low mathematical resilience (Attami et al., 2020; Cahyaningsih et al., 2021; Rohmah et al., 2020). Students who have low resilience easily give up when experiencing difficulties and are not able to complete Polya's problem solving steps completely (Harahap & Manurung, 2022; Nurfitri & Jusra, 2021). Students who have low mathematical resilience tend to be lazier and do not dare to take risks in solving mathematical problems, especially students who are not interested in mathematics (Attami et al., 2020). According to 'Athiyah et al. (2020), students with low resilience quickly feel frustrated when facing difficulties and perceive them as a burden and threat so they easily give up on solving mathematical problems. According to Fitriani et al. (2023), students who have negative mathematical resilience tend to feel anxious, avoid problems, think negatively, and feel helpless so that it is usually difficult to solve mathematical problems. So it can be concluded that students who have low mathematical resilience will also have low mathematical problem solving abilities because they are easily frustrated when they encounter difficulties and choose to give up.

Mathematical resilience has a big effect on mathematical problem solving abilities. So special attention is needed to students who have low mathematical resilience. There are many factors that influence mathematical resilience, one of which is the learning environment (Johnston-Wilder & Lee, 2010). The learning environment can be determined by the type of learning model and approach used. According to Ariyanto et al. (2019), students with the problem based learning model obtained a higher average increase in mathematical resilience than students with conventional learning. This is in line with the results of research by Hutauruk (2019), which also shows that there is a tendency for students' mathematical resilience to be better in problem based learning classes than in conventional classes. Based on the results of Hutauruk (2019), students with the problem based learning model show a persistent nature, never give up and always give a positive response, while students with the conventional model claim they will solve the problem but if they encounter a deadlock, they will postpone solving it and wait for the teacher to explain the solution. Students' mathematical resilience is better in learning with an open ended approach (Ginting et al., 2023). So the problem based learning model and open ended approach can develop students' mathematical resilience.

CONCLUSION

From the research that has been carried out, it can be concluded that mathematical resilience has a positive effect on mathematical problem solving abilities by 44.488% with a simple linear regression equation is $Y = 8.2488 + 0.6426X$. The effect of of mathematical resilience to mathematical problem solving ability is large, with average of effect size is 0.764.

It is recommended for teachers to develop students' mathematical resilience. This is because mathematical resilience has a positive effect on students' mathematical problem solving abilities. One of the learning models recommended to increase students' mathematical resilience is the problem based learning model. One of the learning approach recommended to increase students' mathematical resilience is the open ended approach.

REFERENCES

'Athiyah, F., Umah, U., & Syafrudin, T. (2020). Pengaruh Mathematical Resilience Terhadap Kemampuan Pemecahan Masalah Matematis Siswa. *JKPM (Jurnal Kajian Pendidikan Matematika), 5*(2), 223. https://doi.org/10.30998/jkpm.v5i2.5286

Ariyanto, L., Herman, T., Sumarmo, U., & Suryadi, D. (2019). Prospective teachers' mathematical resilience after participating in Problem-based Learning. *Journal of Physics: Conference Series*. https://doi.org/10.1088/1742-6596/1280/4/042036

Arjun, M., & Muntazhimah, M. (2023). The Effect of Mathematical Resilience on the Mathematical Problem-Solving Ability of Students. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *12*(1), 944–950. https://doi.org/10.24127/ajpm.v12i1.6584

Attami, D., Budiyono, B., & Indriati, D. (2020). The mathematical problem-solving ability of junior high school students based on their mathematical resilience. *Journal of Physics: Conference Series*, 1–7. https://doi.org/10.1088/1742-6596/1469/1/012152

Bernard, M., Nurmala, N., Mariam, S., & Rustyani, N. (2018). Analisis Kemampuan Pemecahan Masalah Matematis Siswa SMP Kelas IX Pada Materi Bangun Datar. *SJME (Supremum Journal of Mathematics Education)*, *2*(2), 77–83.

Branca, N. A. (1980). *Problem Solving as a Goal, Process, and Basic Skill. In Problem Solving in School Mathematics: 1980 Yearbook edited by S. Krulik & R. E. Eyes*. NCTM.

Budiastuti, Y., & Supardi. (2020). Pengaruh Gaya Kognitif dan Resiliensi Matematis Terhadap Kemampuan Pemecahan Masalah Matematika (Studi Expost facto Pada SMK Swasta Di Kabupaten Bekasi). *Alfarisi: Jurnal Pendidikan MIPA*, *3*(3), 31–40.

Cahyaningsih, U., Nahdi, D. S., Jatisunda, M. G., & Suciawati, V. (2021). Student'S Mathematical Problem-Solving Ability With Mathematical Resilience and Metacognition Skills: a Quantitative Analysis. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *10*(4), 2591–2601. https://doi.org/10.24127/ajpm.v10i4.4366

Cooper, H. M., Hedges, L. V, & Valentine, J. C. (2009). Handbook of Research Synthesis and Meta-Analysis 2nd Edition. In *The Lancet* (Vol. 389, Issue 10082). Russell Sage Foundation.

Fatimah, A. E., Purba, A., & Siregar, Y. A. (2021). Hubungan Resiliensi Matematis Terhadap Kemampuan Pemecahan Masalah Matematis Mahasiswa Pada Mata Kuliah Matematika Dasar. *Journal of Didactic Mathematics*, *1*(3), 151–157. https://doi.org/10.34007/jdm.v1i3.470

Fitriani, Herman, T., & Fatimah, S. (2023). Considering the Mathematical Resilience in Analyzing Students' Problem-Solving Ability through Learning Model Experimentation. *International Journal of Instruction*, *16*(1), 219–240. https://doi.org/10.29333/iji.2023.16113a

Ginting, A. S. E. B., Rusman, A. A., & Afri, L. D. (2023). Pengaruh Pendekatan Open Ended Terhadap Kemampuan Pemecahan Masalah Matematis Dan Mathematical Resilience. *Relevan: Jurnal Pendidikan Matematika*, *3*(1), 44–48.

Harahap, I. H., & Manurung, A. A. (2022). Analisis Pengaruh Resilensi Terhadap Kemampuan Pemecahan Masalah Matematis Siswa Di MTs Ruhul Islam Sialambue. *EduTech: Jurnal Ilmu Pendidikan Dan Ilmu Sosial*, *8*(1), 94–97. https://doi.org/10.30596/edutech.v8i1.9962

Hewi, L., & Shaleh, M. (2020). Refleksi Hasil PISA (The Programme For International Student Assesment): Upaya Perbaikan Bertumpu Pada Pendidikan Anak Usia Dini. *Jurnal Golden Age*, *04*(1), 30–41.

Hutauruk, A. J. B. (2019). Perilaku Resiliensi Matematis Mahasiswa Melalui Model Problem-Based Learning Dengan Pendekatan Metakognitif. *Sepren: Journal of Mathematics Education and Applied*, *1*(01), 7–16. https://doi.org/10.36655/sepren.v1i01.76

Inayah, F., & Agoestanto, A. (2023). Kemampuan Pemecahan Masalah Ditinjau Dari Resiliensi Matematis: Tinjauan Pustaka Sistematis. *JUMLAHKU: Jurnal Matematika Ilmiah STKIP Muhammadiyah Kuningan*, *9*(1), 74–86. https://doi.org/10.33222/jumlahku.v9i1.2798

Johnston-Wilder, S., & Lee, C. (2010). Developing mathematical resilience. *BERA Annual Conference*.

Kania, N., & Arifin, Z. (2019). Analisis Kesulitan Calon Guru Sekolah Dasar Dalam Menyelesaikan Soal Pemecahan Masalah Matematis Berdasarkan Prosedur Newman [Analysis of Prospective Elementary School Teachers' Difficulties in Solving Mathematical Problem Solving Based on Newman's Procedure]. *SJME (Supremum Journal of Mathematics Education)*, *3*(1), 57–66.

Krulik, S., & Rudnick, J. A. (1995). *The New Sourcebook for Teaching Reasoning and Problem Solving in Elementary School*. Allyn and Bacon.

Kuncoro, K. S., & Juandi, D. (2023). The Effect of Module-Assisted Direct Instruction on Problem-Solving Ability Based on Mathematical Resilience. *Journal of Medives : Journal of Mathematics Education IKIP Veteran Semarang*, *7*(1), 8–15. https://doi.org/10.31331/medivesveteran.v7i1.2137

Lutfiyana, L., Tsani, D. F., & Tafrikan, M. (2022). Pengaruh Kemandirian Belajar dan Resiliensi Matematis terhadap Kemampuan Pemecahan Masalah Matematis Siswa. *Buana Matematika : Jurnal Ilmiah Matematika Dan Pendidikan Matematika*, *12*(1), 61–70. https://doi.org/10.36456/buanamatematika.v12i1.5529

Maharani, S., & Bernard, M. (2018). Analisis Hubungan Resiliensi Matematik Terhadap Kemampuan Pemecahan Masalah Siswa Pada Materi Lingkaran. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, *1*(5), 819–826. https://doi.org/10.22460/jpmi.v1i5.p819-826

Maulina, V., Harun, L., & Sutrisno. (2022). Pengaruh Kemandirian Belajar dan Resiliensi Matematis terhadap Kemampuan Pemecahan Masalah Matematis Siswa. *Imajiner: Jurnal Matematika Dan Pendidikan Matematika*, *4*(4), 347–354. https://doi.org/10.36456/buanamatematika.v12i1.5529

Nahdi, D. S. (2020). Mathematical Resilience Dalam Memecahkan Masalah Matematika Di Sekolah Dasar. *Seminar Nasional Pendidikan, FKIP UNMA 2020*, *1*(1), 1000–1009.

NCTM. (2000). *Principles and Standards for School Mathematics*. NCTM.

Nurfitri, R. A., & Jusra, H. (2021). Analisis Kemampuan Pemecahan Masalah Matematis Peserta Didik Ditinjau dari Resiliensi Matematis dan Gender. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *5*(2), 1943–1954. https://doi.org/10.31004/cendekia.v5i2.723

Olo, E., Son, A. L., & Klau, K. Y. (2023). Pengaruh Resiliensi Matematis Terhadap Kemampuan Pemecahan Masalah Siswa kelas VIII Sekolah Menengah Pertama. *MATH-EDU: Jurnal Ilmu Pendidikan Matematika*, *8*(2), 119–126. https://doi.org/10.32938/jipm.8.2.2023.119-126

Polya. (1973). *How To Solve It: a new aspect of mathematical mathod*. Princeton University Press.

Priatna, N., Avip, B., & Mulyati Mustika Sari, R. (2022). Efektifitas Project Based Learning-STEM dan Pemecahan Masalah Matematis Siswa pada Materi Trigonometri. *SJME (Supremum Journal of Mathematics Education)*, *6*(2), 151–161.

https://doi.org/10.35706/sjme.v6i2.6588

Rahmatiya, R., & Miatun, A. (2020). Analisis Kemampuan Pemecahan Masalah Matematis Ditinjau Dari Resiliensi Matematis Siswa SMP. *Teorema: Teori Dan Riset Matematika*, *5*(2), 187–202. https://doi.org/10.25157/teorema.v5i2.3619

Retnawati, H., Apino, E., Kartianom, Djidu, H., & Anazifa, R. D. (2018). Pengantar Meta Analisis. In *Parama Publishing*. Parama Publishing.

Rohmah, S., Atmojo Kusmayadi, T., & Fitriana, L. (2020). Problem solving ability of junior high school students viewed by mathematical resilience. *Universal Journal of Educational Research*, *8*(7), 3026–3033. https://doi.org/10.13189/ujer.2020.080731

Satya, M. A., Putri, A. D., & Nizar, H. (2022). Analisis Kemampuan Pemecahan Masalah Matematis pada Pembelajaran Matematika Dilihat dari Tipe Kepribadian Peserta Didik. *SJME (Supremum Journal of Mathematics Education)*, *6*(2), 211–221. https://doi.org/10.35706/sjme.v6i2.5786

Sukestiyarno. (2021). *Olah Data Deskriptif dan Inferensial (Teori dan Praktek)*.

Sumarmo, U. (2015). *Resiliensi Matematik (Mathematical Resilience)*. utari-sumarmo@dosen.stkipsiliwangi.ac.id

Torio, M. Z. C. (2015). Development of Instructional Material Using Algebra as a Tool in Problem Solving. *International Journal of Education and Research*, *3*(1), 569–586.

Wagner, T. (2010). *Overcoming The Global Achievement Gap (online)*. Harvard Univeristy.

Wahyuni, N. P., & Masriyah, M. (2021). Profil Kemampuan Pemecahan Masalah PISA pada Konten Change and Relationship Berdasarkan Taksonomi SOLO. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *5*(3), 2604–2618. https://doi.org/10.31004/cendekia.v5i3.901

Yuniar, S., Nafiah, M., & Siregar, R. (2022). Hubungan antara Resiliensi Matematis dan Kemampuan Pemecahan Masalah Matematika Siswa di Sekolah Dasar. *Edukatif : Jurnal Ilmu Pendidikan*, *4*(3), 4124–4131. https://doi.org/10.31004/edukatif.v4i3.2666