

PROFILE OF STUDENTS' PROBLEM-SOLVING ABILITIES BASED ON KEIRSEY'S PERSONALITY IN SOLVING ETHNOMATHEMATICS PROBLEMS

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Abstract:

Problem-solving abilities are essential for students to face developments in the 21st century. This research examines students' problem-solving abilities in solving ethnomathematics-based problems in terms of Keirsey's personality type. This research uses a qualitative approach with a case study method. The research instrument is a questionnaire to measure Keirsey's personality type (artisan, guardian, idealist, and rational), an ethnomathematics-based problem-solving test instrument with the Polya problem-solving stages. Research subjects were chosen based on specific considerations: students with artisan, guardian, idealist, and rational personality types. Data collection was carried out using questionnaires, tests, and interviews. Based on the results of the analysis, it was found that each student with a different personality type had different problem-solving abilities. Students with a rational personality type can fulfill all stages of Polya problem-solving in each problem. Students with the guardian personality type skip checking back on a problem. Students with an artisan personality type lack planning. Meanwhile, students with an idealistic personality type cannot fulfill the problem-solving stages in all problems. These findings emphasize differences in problem-solving abilities for each personality type, so they can be used as a reference for designing learning based on personality type.

Keywords: Problem-Solving Ability, Polya's Problem-Solving Stage, Keirsey's Personality Type, Ethnomathematics.

PROFIL KEMAMPUAN PEMECAHAN MASALAH SISWA BERDASARKAN TIPE KEPERIBADIAN KEIRSEY DALAM MEMECAHKAN MASALAH ETNOMATEMATIKA

Abstrak:

Kemampuan pemecahan masalah penting untuk dimiliki oleh siswa untuk menghadapi perkembangan abad 21. Adapun tujuan dari penelitian ini adalah untuk

mengkaji kemampuan pemecahan masalah siswa dalam menyelesaikan masalah berbasis etnomatematika yang ditinjau dari tipe kepribadian Keirsey. Penelitian ini menggunakan pendekatan kualitatif dengan metode studi kasus. Instrumen penelitian adalah angket untuk mengukur tipe kepribadian Keirsey (artisan, guardian, idealis, dan rational), instrumen tes pemecahan masalah berbasis etnomatematika dengan tahapan pemecahan masalah Polya. Subjek penelitian dipilih berdasarkan pertimbangan tertentu, yakni siswa dengan tipe kepribadian artisan, guardian, idealis, dan rational. Pengumpulan data dilakukan dengan metode angket, tes, dan wawancara. Berdasarkan hasil analisis diperoleh bahwa setiap siswa dengan tipe kepribadian berbeda memiliki kemampuan pemecahan masalah yang berbeda. Siswa dengan tipe kepribadian rasional mampu memenuhi semua tahapan pemecahan masalah Polya di setiap masalah. Siswa dengan tipe kepribadian guardian, melewati tahapan mengecek kembali pada satu masalah. Siswa dengan tipe kepribadian artisan kurang dalam perencanaan. Sedangkan siswa dengan tipe kepribadian idealis tidak dapat memenuhi tahapan pemecahan masalah dalam seluruh masalah. Temuan ini menekankan perbedaan kemampuan pemecahan masalah setiap tipe kepribadian, sehingga dapat dijadikan acuan untuk merancang pembelajaran berdasarkan tipe kepribadian.

Kata Kunci: Kemampuan Pemecahan Masalah, Tahapan Pemecahan Masalah Polya, Tipe Kepribadian Keirsey, Etnomatematika

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INTRODUCTION

Developments in the 21st century require everyone to have six skills known as 6C, which include critical thinking and problem-solving, communication, creativity and innovation, collaboration, computational logic, and compassion (Kemdikbudristek, 2020). Problem-solving ability is one of the skills that students need to have in the 21st century to keep up with the era of Society 5.0 (Sari, Anshori, Rohmah, & Dari, 2023). Also, problem-solving skills can help students think analytically to make decisions and improve critical thinking skills when dealing with specific situations (Dewi & Minarti, 2018).

Problem-solving refers to a cognitive process directed toward achieving a goal when initially a person does not know the method of solving the problem because problems arise when a person has a goal but does not know

how to achieve it (Mayer, 2019). Problem-solving abilities can help with problem-solving activities based on essential knowledge (Kurniawan, Setiawan, & Hidayat, 2019). Through problem-solving skills, students can increase their analytical power and apply it to various situations (Nurhasanah & Luritawaty, 2021). In learning mathematics, problem-solving skills provide benefits in seeing the relevance of mathematics to other subjects, even in real life (Latifah & Afriansyah, 2021). Several stages can be done to solve problems according to Polya (1978), namely 1) understanding the problem, 2) planning to solve the problem, 3) implementing a plan to solve the problem, and 4) looking back.

Facts in the field show that students' problem-solving abilities still need improvement. They still need help solving mathematical problems that require complex procedures and applications. (Gradini, Yustinaningrum, & Safitri, 2022; Novianti & Roesdiana, 2022). The 2018 Program International Student Assessment (PISA) study results show that Indonesia is ranked 73 out of 79 in the mathematics category, with a score of 379 from the OECD average of 487 with 379 with OECD average score of 487 (OECD, 2019). In 2022, Indonesia's PISA ranking in mathematics increased to 68 from 81, but the average decreased to 366 from the OECD average of 472 (OECD, 2023). Mathematics in PISA measures problem-solving and reasoning skills, so it can be said that PISA results show students' problem-solving abilities (Rosana, Widodo, Setianingsih, & Setyawarno, 2020). So, based on the PISA results, it can be seen that students' problem-solving abilities in Indonesia still need to improve (Asdarina & Ridha, 2020). That is also supported by daily learning results showing poor performance in mathematical problem-solving abilities (Hidayat & Sariningsih, 2018).

Problem-solving abilities must be identified, studied, and acted upon to design learning processes to improve them. One way to identify problem-solving abilities is by administering written and computer-based tests (Ridhwan, Sumarmi, Ruja, Utomo, & Sari, 2020; Scherer, Messinger-Koppelt, & Tiemann, 2014; Schoenfeld, 1982). Written tests are more accessible and can focus on problem-solving (Ridhwan, Sumarmi, Ruja, Utomo, & Sari, 2020; Scherer, Messinger-Koppelt, & Tiemann, 2014). Written tests that measure problem-solving must be story questions (Mawaddah, Anwar, Yusrizal, & Zubainur, 2021). When solving math story problems, students must understand the meaning of the problem and present it in mathematical form (Ratnamutia & Pujiastuti, 2020; Restuningsih & Khabibah, 2021). However,

many students still have difficulty solving story problems, so it is necessary to develop questions closely related to students (Gunawan, 2018). One way is to develop questions based on culture or ethnomathematics because all forms and learning processes in mathematics will always be surrounded by a culture (Sroyer, Nainggolan, & Hutabarat, 2018).

Ethnomathematics is a way to study mathematics practiced in a culture (Saputra, Mirsa, Yanti, Wulandari, & Husna, 2022). Apart from being practiced in culture, ethnomathematics can be described as mathematics built from cultural knowledge (Kusuma, Suryadi, & Dahlan, 2019). Therefore, culture-based problems can encourage students to link their knowledge with culture and problems in real life (Ulya & Rahayu, 2020).

Apart from the form of questions that need to be considered, students' personalities must also be considered because they can influence their problem-solving abilities (Kaplan & Owings, 2017; Tarigan, Wulandari, Maulida, & Luluatnul, 2019; Zuniana & Rahaju, 2019). Personality consists of characteristic thoughts, feelings, and behavior patterns that make a person unique (Pundir & Agarwal, 2016). One personality classification that can be used is the Keirsey Personality Type. Keirsey divides personality based on temperament, character, and intelligence (Keirsey, 1998). Keirsey groups personalities into Guardians, Artisans, Rationales, and Idealists (Keirsey, 1998). In schools, guardian types tend to be interested in studying business; artisan types tend to be more interested in art; rational types prefer science; and idealist types are interested in humanities (Keirsey, 1998). In the learning process, the guardian type likes conventional learning models; the artisan type likes active classes with lots of demonstrations and discussions; the rational type likes logical learning; and the idealist type likes independent learning (Hidayatulloh, Usodo, & Riyadi, 2013). It can be seen that each type has a different way of learning and has a tendency to learn something, which means that each type has different characteristics that will influence their problem-solving abilities (Satya, Putri, & Nizar, 2022).

There are several previous studies regarding problem-solving abilities in terms of personality type. (Arini & Rosyidi, 2016; Mawaddah, Anwar, Yusrizal, & Zubainur, 2021; Rabbani, Baidowi, Wahidaturrahmi, & Sripatmi, 2022; Zuniana & Rahaju, 2019). However, there has yet to be any specific research regarding students' problem-solving abilities in solving ethnomathematics-based problems regarding their personality type. Therefore, this research focuses on students' problem-solving abilities in solving

ethnomathematics-based problems regarding Keirsey's personality type. The results of this research can be used as a reference for developing learning based on ethnomathematics-based student personality types and problem-solving abilities.

METHODS

This research uses a qualitative approach with a case study method. This research begins with an introductory analysis and an analysis of the research needs. The data collection techniques used in this research consisted of tests and interviews. This research used two tests: the Keirsey personality type test and an ethnomathematics-based problem-solving ability test. A personality test aims to obtain information about the personality type possessed by students, and the results are used to determine research subjects and collect data that supports research. The problem-solving ability test is used to analyze student answers according to the stages of problem-solving ability. The type of interview that will be used in this research is a semi-structured interview because it is to find problems more openly.

The instruments used in this research were personality test instruments, problem-solving test instruments using ethnomathematics problems, and interview guides. The personality test instrument used is the Keirsey Personality Type Test, consisting of 16 questions about how a person responds to specific events according to their habits or thoughts (Keirsey, 1998). The Keirsey personality type test is used to classify personalities into guardian, artisan, rational, or idealist personality types. The ethnomathematics-based problem-solving test instrument consists of four questions arranged based on Polya's problem-solving stages, namely 1) understanding the problem, 2) planning to problem-solve, 3) implementing a plan to solve the problem, and 4) looking back or checking back on the results obtained (Polya, 1978).


Before the test instrument is given, the test instrument is validated using content validation. Meanwhile, the interview guide used in this research adapts to the stages of problem-solving abilities. This interview is used as accompanying data from the results of students' answers to the problem-solving ability test. The subjects in this research were 40 students in grade 12, who were then selected four people based on Keirsey's personality type, namely Guardians, Artisans, Rational, and Idealists. Previously, students filled out Keirsey's personality questionnaire, then classified based on Keirsey's personality type. Then, students are given ethnomathematics-based problem-

solving test questions on opportunity material. After the research subject was determined, the answers to the mathematical literacy ability test questions were analyzed using indicators of Polya's problem-solving ability. Next, the selected subjects are interviewed to confirm the student's answers. Finally, the data obtained is reduced and presented, and the results are concluded.

RESULTS AND DISCUSSION


This research obtained the results of the answers to the Keirse personality questionnaire and the results of an ethnomathematics-based problem-solving test. Of the 40 students, there were 14 with artisan personalities, 6 idealist students, 13 guardian students, and 7 rationalist students. Next, four students were selected to represent each personality type. After a personality questionnaire, students are given an ethnomathematics-based problem-solving test of 4 essay questions on probability material.

1. Eneng, Ujang, dan Asep pada Minggu pagi bermain sapinrong. Mereka melakukan permainan suwit untuk menentukan siapa yang akan melompat dan memegang tali, dan Eneng lah yang pertama kali melompat. Setelah beberapa kali melompat, ternyata dari sepuluh kali lompatan, Eneng selalu gagal hanya dua kali saja. Ujang akan mendapat giliran bermain setelah Eneng gagal dalam lompatannya. Tentukan peluang Ujang bermain setelah Eneng gagal pada lompatan ke 15.




Sumber: <https://pin.it/5tq9BQ>

3. Di perpustakaan sekolah, selain terdapat banyak bacaan, disediakan juga beberapa permainan tradisional, seperti congklak, bekel dan ular tangga. Jeni dan teman-temannya pergi ke perpustakaan saat istirahat siang. Di perpustakaan Jeni tidak membaca, tapi bermain bekel. Permainan pertama di mulai oleh Jeni. Pertama, Jeni mengambil satu persatu biji bekel dengan lancar. Akan tetapi pada saat harus mengambil empat biji bekel sekaligus, Jeni mulai kebingungan, karena biji bekelnnya khawatir menyentuh biji lainnya. Jika biji-biji bekelnnya tersebar seperti pada gambar berikut, berapa peluang Jeni mengambil biji nomor 3 saat mengambil empat biji bekel. Catatan: setiap biji punya peluang yang sama untuk diambil.




2. Di hari minggu, santri kelas 12 sering berolahraga bersama di pagi hari. Minggu ini, mereka berencana berolahraga sambil bermain permainan tradisional. Salah satu permainan yang akan dimainkan adalah oray-orayan. Oray-orayan adalah permainan tradisional Sunda yang dimainkan sambil bernyanyi dan menirukan ular. Seperti yang kita ketahui dalam permainan oray-orayan, yang tertangkap dapat memilih berada di belakang salah satu penjaga. Tetapi tidak semua siswa mengetahui permainan ini. Sehingga beberapa siswa memberi contoh permainan. Rika dan 5 orang temannya menjadi ular, sedangkan Cika dan Mimi menjadi penjaga. Tentukan peluang terpilihnya Cika hanya oleh satu pemain.



Sumber: <https://pin.it/7G4IRYg>

4. Eneng, Euis, dan Elis bermain sondah bersama di halaman rumah Euis. Untuk menentukan pemain pertama, Eneng dan teman-temannya sepakat untuk melempar gacuk ke kotak sondah. Pemain pertama adalah yang melempar di kotak dengan nomor tertinggi. Eneng berhasil melempar gacuknya ke kotak bernomor 6 sedangkan Euis melempar ke kotak nomor 3. Berapa peluang Elis bisa bermain sebelum Euis



Sumber: <https://pin.it/5tq9BQ>

Figure 1. Ethnomathematics-based Problem-Solving Test

After the subjects submit their answers, an interview is then carried out. The following are the results of the analysis of answers and interview answers to the four subjects based on the Polya problem-solving stages.

Table 1. The result of The Analysis

Subject	Personality Type	Number of Question	Polya's Problem-Solving Stages			
			Understanding the Problem	Planning to Problem-Solve	Implementing a Plan	Looking Back
SA	Artisan	1	o	x	o	x
		2	✓	✓	✓	✓
		3	✓	o	✓	x
		4	o	x	o	x
SI	Idealist	1	o	o	o	x
		2	✓	✓	✓	✓
		3	✓	✓	✓	✓
		4	✓	x	x	x
SG	Guardian	1	✓	✓	✓	x
		2	✓	✓	✓	✓
		3	✓	✓	✓	✓
		4	✓	✓	✓	✓
SR	Rational	1	✓	✓	✓	✓
		2	✓	✓	✓	✓
		3	✓	✓	✓	✓
		4	✓	✓	✓	✓

✓ : Students can answer questions and fulfill indicators.

o : Students meet the indicators but do not answer correctly.

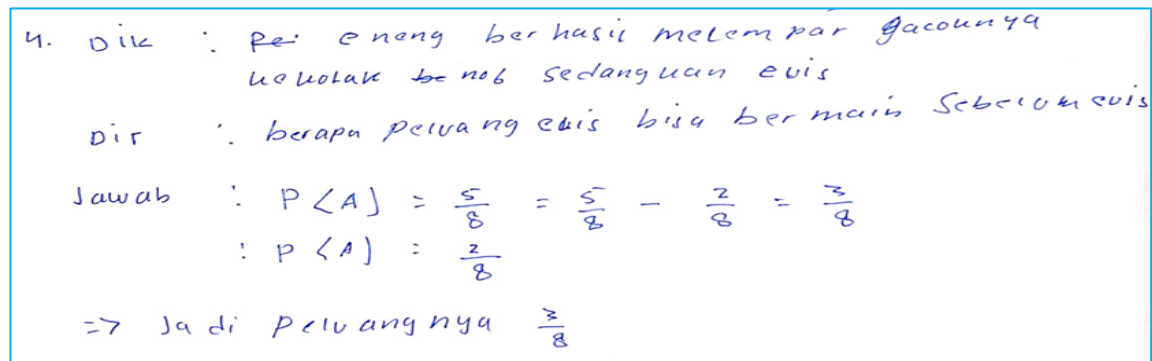
x : Students do not meet the indicators.

Based on the results of the answers to the four subjects above, there are differences in the problem-solving achievements of students from each Keirse personality type. The following is a discussion of each personality type.

1. Artisan

Based on Table 1, the students with artisan personality type, subject SA, can fulfill the problem-solving stages and complete the answer correctly on only one question out of four. In solving the problem, two questions did not plan to solve the problem first but solved it straight away. So, when solving

the problem, subjects with the artisan personality type could not answer the question correctly because they missed the problem-planning stage. That is in line with research results (Astuti, Aminudin, & Maharani, 2018) that show that students with artisan personalities can understand problems but have difficulty planning problem solutions, which results in students having difficulty solving problems.



Handwritten student work for a probability problem. The text is written in blue ink on a white background. It shows a problem statement in Indonesian, a question, and a solution using probability formulas.

4. Dik : Perenang berhasil melempar gacangnya
ke kotak benol sedangkan eis

Dir : berapa peluang eis bisa bermain sebelum eis

Jawab : $P(A) = \frac{5}{8} = \frac{5}{8} - \frac{2}{8} = \frac{3}{8}$
: $P(A) = \frac{2}{8}$

\Rightarrow Jadi peluangnya $\frac{3}{8}$

Figure 2. One of SG's answers

As for another problem, the planning steps were implemented but needed to be done correctly. Meanwhile, rechecking the answer is only carried out on one resolved problem. Based on the interview results, it was also found that subject SA did not recheck his answer because he felt confident and had difficulty answering it, so he did not recheck it. Subject SA felt confident because the ethnomathematics problem given was related to the knowledge he had. In line with the research results (Masriyah & Firmansyah, 2018), students with artisan personalities solve problems without planning but according to what they believe. Artisan students can connect known information with the knowledge they have to make plans (Solichah & Sulaiman, 2019).

2. Idealist

The student with an idealistic personality, subject SI, can solve two problems correctly using problem-solving stages. One question fulfills the stages of understanding, planning, and implementing the plan but needs to be more precise. Meanwhile, the other one understands the problem correctly but cannot solve it. That is because the SI subject feels that the problem is too complex, so the SI subject feels confused in understanding and solving it. The SI subject can explain the problem but cannot explain how to solve it.

2) Dik: 11 pemain
 2 panjang
 salah satu panjang harus di lakukan
 satu pemain

$$\text{jawab } P = \frac{C(11)}{n(11)} = \frac{1}{2}$$

Banyak cara salah satu orang terpilih
 dan panjang adalah
 $6(1) = 6$
 sehingga peluang terpilihnya satu orang
 ter sebut adalah
 $6(1 \times \frac{1}{2} \times (\frac{1}{2})^5 = \frac{6}{64}$
 jadi peluangnya $\frac{6}{64}$

Figure 3. One of SI's answers

Subjects with an idealistic personality type have been unable to solve it correctly because they like to apply trial-and-error strategies (Masriyah & Firmansyah, 2018). Apart from that, it can also happen because idealistic types prefer to work together to solve problems. Even so, problems related to ethnomathematics help students with idealistic personalities with reading questions. The idealist type likes reading and writing, so they like math problems in the form of story problems (Nismaya, 2018).

3. Guardian

Based on the analysis results, SG (Guardian's Subject) could fulfill the problem-solving stages only on one question; SG did not check again. That means the student with the guardian personality type can understand problems, plan problem solutions, carry out orders, and even recheck the answers. Based on the interview results, it was also found that the SG subject felt that the problem given required deeper study to understand the problem. Subject SG felt that, at first, it seemed difficult, but after looking back, he could understand the problem. SG subject works slowly, not in a hurry, and double-

check to ensure the explanation is correct. The story about traditional games means SG didn't get bored reading it repeatedly. Problems with traditional games mean SG didn't get bored reading them repeatedly.

Handwritten solution for a probability problem:

1. Dik : Energi $(10 - 8) = 2$ kawatian gagal
 Dit : Ujang ?
 Jawab : $P = \frac{n(A)}{n(S)} = \frac{10 - 2}{10} = \frac{2}{5}$ lalu $P = \frac{n(A)}{n(S)} = \frac{2}{10} = \frac{1}{5} \rightarrow \left(\frac{4}{5}\right)^5 \left(\frac{1}{5}\right) = 0.0088$
 Jadi peluangnya adalah 0,0088

Figure 4. One of SG's answers

The analysis of students with the Guardian personality aligns with the research results (Masriyah & Firmansyah, 2018) that show that students with the Guardian personality type can model problems in mathematical form and design and implement strategies to solve problems. Apart from that, based on research results (Hanifa & Masriyah, 2019), students with the Guardian personality type start the problem-solving process by reading the problem to understand it, thinking of ideas to solve it, then solving it, and finally rechecking the explanation. Students with the guardian personality type are also interested in ethnomathematics problems, which aligns with research results (Kasriana & Ode, 2020) that show that the guardian type is interested in contextual problems.

4. Rational

Subject SR (student with a rational personality type) can solve all problems correctly using Polya's problem-solving stages. SR can understand the problem, translate it into his language, plan a solution, and implement it. The following research results (Hanifa & Masriyah, 2019) showed that students with a rational personality type can understand problems slowly, look for ideas for solving problems but do not have other alternative methods, and can solve problems well and recheck the answers to ensure.

③ Dik : Jumlah biji, bekel = 6
 Jenu akan mengambil 4 biji bekel sekalingus

Dit : Jika biji 3 bekelnya tersebar 5 pada gambar berikut, berapa peluang jenu mengambil biji no 3 saat mengambil 4 biji bekel.

Jawab :

- jumlah kombinasi dari mengambil biji no 3 dari 4 biji yang mau diambil

$$SC_3 = \frac{5!}{(5-3)! 3!} = \frac{5!}{2! 3!}$$

$$= \frac{5 \times 4 \times 3!}{2! 3!} = 10$$
- mencari cara keseluruhan

$$6C_4 = \frac{6!}{(6-4)! 4!} = \frac{6!}{2! 4!}$$

$$= \frac{6 \times 5 \times 4!}{2! 4!} = 15$$

sehingga $SC_3 : 6C_4 = \frac{10}{15} = \frac{2}{3}$

mencari kebenaran @ = $\frac{SC_4}{6C_4} = \frac{5}{15} = \frac{1}{3}$

Jika, peluang pengambilan 1 = $\frac{1}{3} = \frac{2}{3}$

Figure 5. One of SR's answers

Based on the results of the interview, the SR subject felt confident with the answer and was able to explain the solution process. That is in line with the research results (Masriyah & Firmansyah, 2018), which states that the solution results obtained by students with the rational type are correct and can explain the reasons based on the calculation process. The rationalist personality type is a type of person who thinks analytically so that the calculation process is explained as the reason for the correctness of the results. Students with a rational personality type can connect mathematics with everyday problems, such as those related to culture or ethnomathematics (Sutrisno, Nusantara, & Susiswo, 2019).

CONCLUSION

Based on the research results presented, each student with a different personality type has different problem-solving abilities. Students with a rational personality type have better problem-solving abilities than others because they can solve problems correctly using problem-solving stages. Students with the guardian personality type also have good problem-solving abilities, even though one problem still needs to be rechecked. Meanwhile, students with artisan and idealist personality types have problem-solving abilities that are not as good as rational or guardian personality types because problems cannot be appropriately solved using problem-solving stages. Even

so, ethnomathematics questions help every personality type in solving problems better. The results of these findings can be used as a reference for designing ethnomathematics learning based on personality type.

This research is limited to only analyzing the results of students' answers and confirming the answers without investigating the causes. Further research can identify the causal factors so that learning can be designed according to personality type for better problem-solving abilities.

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REFERENCES

- Arini, Z., & Rosyidi, A. H. (2016). Profil kemampuan penalaran siswa SMP dalam menyelesaikan masalah matematika ditinjau dari tipe kepribadian extrovert dan introvert. *MATHEdunesa Jurnal Ilmiah Pendidikan Matematika*, 2(5). <https://doi.org/10.26740/mathedunesa.v5n2.p%25p>.
- Asdarina, O., & Ridha, M. (2020). Analisis kemampuan penalaran matematis siswa dalam menyelesaikan soal setara pisa konten geometri. *Numeracy*, 7(2). <https://doi.org/10.46244/numeracy.v7i2.1167>.
- Astuti, R. P., Aminudin, M., & Maharani, H. R. (2018). Deskripsi metakognisi ditinjau dari tipe kepribadian rational dan artisan. *Kontinu: Jurnal Penelitian Didaktik Matematika*, 2(2), 98. <https://doi.org/10.30659/kontinu.2.2.98-121>.
- Dewi, S. N., & Minarti, E. D. (2018). Hubungan antara self-confidence terhadap matematika dengan kemampuan pemecahan masalah matematik siswa pada materi lingkaran. *Mosharafa: Jurnal Pendidikan Matematika*, 7(2), 189–198. <https://doi.org/10.31980/mosharafa.v7i2.37>.
- Gradini, E., Yustinaningrum, B., & Safitri, D. (2022). Kesalahan Siswa Dalam Memecahkan Masalah Trigonometri Ditinjau dari Indikator Polya. *Mosharafa: Jurnal Pendidikan Matematika*, 11(1), 49–60. <https://doi.org/10.31980/mosharafa.v11i1.1226>.

- Gunawan, A. (2018). Analisis kesalahan dalam menyelesaikan soal cerita pada mata pelajaran matematika siswa kelas V SDN 59 kota bengkulu. *Jurnal PGSD*, 9(2). <https://doi.org/10.33369/pgsd.9.2.216-225>.
- Hanifa, A., & Masriyah. (2019). Proses berpikir kreatif siswa smp dalam memecahkan masalah matematika ditinjau dari tipe kepribadian rational dan guardian. *Jurnal Ilmiah Pendidikan Matematika*, 1(5), 393-399. <https://doi.org/10.26740/mathedunesa.v8n2.p393-399>.
- Hidayat, W., & Sariningsih, R. (2018). Kemampuan pemecahan masalah matematis dan adversity quotient siswa SMP melalui pembelajaran open ended. *JNPM (Jurnal Nasional Pendidikan Matematika)*, 2(1), 109. <https://doi.org/10.33603/jnpm.v2i1.1027>.
- Hidayatulloh, Usodo, B., & Riyadi. (2013). Proses berpikir kreatif siswa smp dalam pemecahan masalah matematika ditinjau dari tipe kepribadian siswa. *Jurnal FKIP UNS*, (20).
- Kaplan, L. S., & Owings, W. A. (2017). Problem-solving and decision-making. In *Organizational Behavior for School Leadership* (pp. 279-311). New York, NY : Routledge. <https://doi.org/10.4324/9781315669502-9>.
- Kasriana, & Ode, R. (2020). Description of the number theory course problem-solving abilities based on the personality type of the math student at Universitas Darussalam Ambon. In *Journal of Physics: Conference Series* (Vol. 1463). <https://doi.org/10.1088/1742-6596/1463/1/012003>.
- Keirsey, D. (1998). *Please understand me II: temperament, character, intelligence*. United States: Prometheus Nemesis.
- Kemdikbudristek. (2020). *Buku panduan penyusunan kurikulum pendidikan tinggi di era industri 4.0 untuk mendukung merdeka belajar-kampus merdeka – direktorat jenderal pendidikan tinggi kementerian pendidikan dan kebudayaan republik indonesia. kementerian pendidikan, kebudayaan, riset, dan teknologi*. Jakarta: Kemdikbud.
- Kurniawan, A., Setiawan, D., & Hidayat, W. (2019). Analisis kemampuan pemecahan masalah matematis siswa SMP berbantuan soal kontekstual pada materi bangun ruang sisi datar. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, 2(5), 271-282. Retrieved from <https://journal.ikipsiliwangi.ac.id/index.php/jpmi/article/view/2976>.
- Kusuma, D. A., Suryadi, D., & Dahlan, J. A. (2019). Improving external mathematical connections and students' activity using ethnomathematics.

In *Journal of Physics: Conference Series* (Vol. 1157). <https://doi.org/10.1088/1742-6596/1157/3/032120>.

Latifah, T., & Afriansyah, E. A. (2021). Kesulitan dalam kemampuan pemecahan masalah matematis siswa pada materi statistika. *Journal of Authentic Research on Mathematics Education (JARME)*, 3(2). <https://doi.org/10.37058/jarme.v3i2.3207>.

Masriyah, & Firmansyah, M. H. (2018). Students' mathematical literacy in solving PISA problems based on keirse personality theory. In *Journal of Physics: Conference Series* (Vol. 953). <https://doi.org/10.1088/1742-6596/953/1/012203>.

Mawaddah, A., Anwar, Yusrizal, & Zubainur, C. M. (2021). The impact of students' personality types on the application of problem-solving strategies in solving PISA questions. *Journal of Physics: Conference Series*, 1882(1), 012062. <https://doi.org/10.1088/1742-6596/1882/1/012062>.

Mayer, R. E. (2019). Problem Solving. In *Oxford Research Encyclopedia of Education*. Oxford University Press. <https://doi.org/10.1093/acrefore/9780190264093.013.860>.

Nismaya, N. (2018). Analisis tipe kepribadian siswa dan pengaruhnya terhadap kemampuan pemecahan masalah matematika menggunakan model pembelajaran problem based learning. *Symmetry: Pasundan Journal of Research in Mathematics Learning and Education*. <https://doi.org/10.23969/symmetry.v3i1.1318>.

Novianti, & Roesdiana, L. (2022). Analisis kemampuan pemecahan masalah matematis siswa sma dalam menyelesaikan soal sistem persamaan linear tiga variabel. *EduMatSains: Jurnal Pendidikan, Matematika Dan Sains*, 6(2). <https://doi.org/10.33541/edumatsains.v6i2.3615>.

Nurhasanah, D. S., & Luritawaty, I. P. (2021). Model pembelajaran REACT terhadap kemampuan pemecahan masalah matematis. *Plusminus: Jurnal Pendidikan Matematika*, 1(1), 71–82. <https://doi.org/10.31980/plusminus.v1i1.1027>.

OECD. (2023). *PISA 2022 Results (Volume I)*. OECD. <https://doi.org/10.1787/53f23881-en>.

Polya, G. (1978). How to solve it: a new aspect of mathematical method second edition. *The Mathematical Gazette*.

- Pundir, N., & Agarwal, N. (2016). A Study of personality traits of B.Ed students. *Learning Community-An International Journal of Educational and Social Development*, 7(2), 127. <https://doi.org/10.5958/2231-458X.2016.00013.0>.
- Rabbani, A., Baidowi, B., Wahidaturrahmi, W., & Sripatmi, S. (2022). Kemampuan pemecahan masalah matematika ditinjau dari tipe kepribadian myers briggs type indicator (MBTI) siswa kelas IX. *Jurnal Ilmiah Profesi Pendidikan*, 7(3b), 1525–1533. <https://doi.org/10.29303/jipp.v7i3b.815>.
- Ratnamutia, S. A., & Pujiastuti, H. (2020). Analisis kesulitan siswa SMP dalam mengidentifikasi dan menyelesaikan soal cerita persamaan linear satu variabel. *Didaktis: Jurnal Pendidikan Dan Ilmu Pengetahuan*, 20(2). <https://doi.org/10.30651/didaktis.v20i2.4785>.
- Restuningsih, V., & Khabibah, S. (2021). Analisis kesalahan siswa dalam pemecahan soal cerita materi persamaan dan pertidaksamaan linier satu variabel. *Jurnal Cartesian*, 1(1), 32–41. <https://doi.org/10.33752/cartesian.v1i1.2078>.
- Ridhwan, R., Sumarmi, S., Ruja, I. N., Utomo, D. H., & Sari, R. M. (2020). Measuring student's environmental problem-solving ability across gender and school differences using paper-based testing. *International Journal of Emerging Technologies in Learning (IJET)*, 15(13), 303. <https://doi.org/10.3991/ijet.v15i13.11709>.
- Rosana, D., Widodo, E., Setianingsih, W., & Setyawarno, D. (2020). Developing assessment instruments of the Pisa model to measure students' problem-solving skills and scientific literacy in junior high schools. *Jurnal Pendidikan Sains Indonesia*, 8(2). <https://doi.org/10.24815/jpsi.v8i2.17468>.
- Saputra, E., Mirsa, R., Yanti, P. D., Wulandari, W., & Husna, A. (2022). Eksplorasi etnomatematika pada arsitektur rumah aceh. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 11(1). <https://doi.org/10.24127/ajpm.v11i1.4751>.
- Sari, D. W., Anshori, M. I., Rohmah, A. N. B., & Dari, W. W. (2023). Manajemen pengembangan kurikulum pendidikan agama islam dan urgensinya dalam menghadapi era society 5.0. *Kuttab*, 7(1). <https://doi.org/10.30736/ktb.v7i1.1460>.
- 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>.
- Scherer, R., Messinger-Koppelt, J., & Tiemann, R. (2014). Developing a computer-based assessment of complex problem-solving in Chemistry. *International Journal of STEM Education*, 1(1), 2. <https://doi.org/10.1186/2196-7822-1-2>.
- Schoenfeld, A. H. (1982). Measures of problem-solving performance and problem-solving instruction. *Journal for Research in Mathematics Education*, 13(1), 31. <https://doi.org/10.2307/748435>.
- Solichah, S. M., & Sulaiman, R. (2019). The profile of junior high school students about PISA problem solving based on personality type. *MATHEdunesa*, 8(3). <https://doi.org/10.26740/mathedunesa.v8n3.p465-471>.
- Sroyer, A. M., Nainggolan, J., & Hutabarat, I. M. (2018). Exploration of ethnomathematics of house and traditional music tools biak-papua cultural. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, 8(3). <https://doi.org/10.30998/formatif.v8i3.2751>.
- Sutrisno, A. S., Nusantara, T., & Susiswo, S. (2019). Student's mathematical connection to problem-solving based on rational personality types. *Jurnal Pendidikan Sains*.
- Tarigan, M., Wulandari, A., Maulida, T., & Luluatnul. (2019). Memahami pengaruh kepribadian terhadap gaya berpikir, gaya pemecahan masalah, dan gaya pengambilan keputusan pada karyawan usia produktif. *Proyeksi: Jurnal Psikologi*, 14(2), 34-46.
- Ulya, H., & Rahayu, R. (2020). Kemampuan representasi matematis field intermediate dalam menyelesaikan soal etnomatematika. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 9(2). <https://doi.org/10.24127/ajpm.v9i2.2695>.
- Zuniana, E. R., & Rahaju, E. B. (2019). Pemecahan masalah aljabar siswa SMP ditinjau dari tipe kepribadian. *Jurnal Ilmiah Pendidikan Matematika*, 8(2), 342-349. <https://doi.org/10.26740/mathedunesa.v8n2.p342-349>.