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CHALLENGES IN GRADE 10 ARITHMETIC SEQUENCES: A NEWMAN'S PROCEDURE ANALYSIS

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ABSTRACT

This study analyzes the difficulties faced by Grade 10 students in solving arithmetic sequence and series problems using Newman's procedure. A descriptive qualitative method was employed, involving three purposively selected students from a high school in Indonesia. Student difficulties were examined across five stages: reading, comprehension, transformation, process skills, and encoding. Data were gathered through problem-solving tasks and semi-structured interviews. Results indicated that high-ability students solved problems with ease, while those with medium and low abilities struggled, particularly in understanding the problem, transforming it into a mathematical model, applying correct procedures, and encoding answers. Most errors occurred during the comprehension and transformation stages, often due to misidentifying known and unknown information and incorrect formula usage. Process-related difficulties included unsystematic application of problem-solving steps. These findings underscore the need to enhance both procedural fluency and conceptual understanding. The study recommends targeted instructional strategies to support students with lower mathematical proficiency. Limitations include the small sample size and narrow scope, suggesting the need for broader future research to strengthen generalizability.

***Keywords**: Student Difficulties, Arithmetic Sequence and Series, Newman's Perspective, Problem Solving*

ABSTRAK

Penelitian ini bertujuan untuk menganalisis kesulitan yang dihadapi siswa kelas 10 dalam menyelesaikan masalah barisan dan deret aritmatika berdasarkan prosedur Newman. Metode yang digunakan adalah deskriptif kualitatif, dengan tiga peserta dipilih melalui purposive sampling dari sebuah SMA di Indonesia. Analisis kemampuan siswa dilakukan di lima tahap pemecahan masalah: membaca, memahami masalah, transformasi, keterampilan proses, dan pengkodean. Data dikumpulkan melalui tugas pemecahan masalah dan wawancara semi-terstruktur. Hasil penelitian menunjukkan bahwa siswa dengan kemampuan tinggi dapat menyelesaikan masalah dengan mudah. Sebaliknya, siswa dengan kemampuan sedang dan rendah menghadapi berbagai tantangan, terutama dalam memahami masalah dan mengubahnya menjadi model matematika, menerapkan keterampilan proses, dan pengkodean. Kesalahan yang paling umum terjadi selama tahap pemahaman dan transformasi, yaitu siswa membutuhkan bantuan untuk mengidentifikasi informasi yang diketahui dan dipertanyakan dengan benar dan sering menerapkan rumus yang salah. Pada tahap keterampilan proses, siswa juga membutuhkan bantuan untuk menerapkan langkah-langkah pemecahan masalah secara sistematis. Temuan ini menyoroti pentingnya memperkuat keterampilan prosedural dan pemahaman konseptual. Studi ini merekomendasikan intervensi pembelajaran yang terstruktur dan spesifik untuk membantu siswa berkinerja rendah memahami dan menerapkan langkah-langkah pemecahan masalah. Penelitian ini memiliki keterbatasan jumlah peserta dan topik yang terbatas, sehingga diperlukan penelitian lebih lanjut untuk generalisasi yang lebih luas.

***Kata Kunci:** Kesulitan Siswa, Barisan dan Deret Aritmetika, Prosedur Newman, Pemecahan Masalah*

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I. INTRODUCTION

Mathematical problem-solving ability refers to a student's capacity to understand, analyze, plan, and solve mathematical problems related to real-life applications (Setyaningrum et al., 2024; Siswanto & Meiliasari, 2024). Problem-solving is essentially a process in which individuals attempt to overcome obstacles when an answer or method is not immediately apparent (Pratiwi et al., 2024). It is also defined as finding solutions by obtaining and organizing information (Khesya & Ananda, 2024). It is a complex process involving metacognitive, cognitive, and affective factors (Scheibe et al., 2023). This ability impacts math learning outcomes and helps students confront real-world challenges (Sinaga et al., 2023; Szabo et al., 2020). Moreover, it enhances math learning outcomes, helps with decision-making, and equips students to tackle challenges in both learning and everyday life (Inayah & Agoestanto, 2023; Kurniawati et al., 2019). One approach used in problem-solving is Newman's procedure, which consists of reading, understanding, transformation, process skills, and encoding (Rohmah & Sutiarso, 2018; Wahidah et al., 2017).

The first step in Newman's problem-solving procedure is reading, where students must correctly read the problem and recognize relevant mathematical symbols (Rohmah & Sutiarso, 2018; Swari et al., 2020). Errors at this stage arise when students need help understanding or identifying the basic information presented. Reading comprehension is very important in problem-solving, especially word problems, and many students have difficulty at this stage (Nahdi et al., 2023). The second stage, comprehension, focuses on the student's ability to grasp the meaning of the problem and understand exactly what is being asked (Rohmah & Sutiarso, 2018; Swari et al., 2020). Comprehension errors occur when students are unable to identify the known information or determine what the problem is asking, often due to poor reading comprehension skills (Özcan & Doğan, 2018).

The third stage, transformation, requires students to convert verbal problems into appropriate mathematical models (Swari et al., 2020). Errors occur when students need help to select the correct method or formula. Research shows that students often need help with this step, which can be attributed to insufficient skills in reading and understanding the problem's context (Krawitz et al., 2022; Reyes-Huerta et al., 2024). After the transformation, students move to the process skills stage, where they are expected to apply the correct mathematical procedures, such as performing calculations. Errors here are typically due to miscalculations or incorrect application of algorithms, even if the correct method was initially chosen (Daswarman, 2020; Logistica & Awalludin, 2024). The final stage is encoding, where students must present the final answer clearly and accurately (Swari et al., 2020). Encoding errors occur when students fail to write the correct or complete answer, even after completing the previous stages, emphasizing the importance of mathematical communication skills in conveying solutions (Schoenfeld, 2016).

Problem-solving is crucial in developing students' logical and analytical thinking skills (Ramadhani & Hakim, 2021). It helps students gain a deeper understanding of mathematical concepts and enables them to apply that knowledge in various real-life situations (Liljedahl et al., 2016). Effective problem-solving requires deep mathematical knowledge, reasoning skills, and heuristic strategies (Tambunan, 2018, 2020). However, many students face challenges in mastering mathematical problem-solving skills, particularly in understanding and interpreting problems, representing them mathematically, executing solution strategies, and performing accurate calculations (Hadi, 2019; Jatmiko, 2018). Students with good problem-solving ability can overcome difficulties in solving problems, while those with poor skills tend to struggle in completing problem-solving tasks (Tika et al., 2024).

Difficulties in mathematical problem-solving can be categorized into cognitive, affective, and pedagogical aspects. From a cognitive perspective, these difficulties often stem from needing more factual, conceptual, and procedural knowledge to solve problems. Research indicates that students frequently struggle to understand and apply learned mathematical knowledge, especially in the context of word problems (Bruno et al., 2021; Jatmiko, 2018; Novferma, 2016). Additionally, students' metacognitive skills—which include the ability to plan, monitor, and evaluate the problem-solving process—are crucial in determining their success (Aprilia et al., 2021).

From an affective perspective, students' motivation and attitudes towards mathematics significantly influence their problem-solving abilities. Students with low motivation or negative attitudes toward mathematics tend to encounter greater difficulties (Jatmiko, 2018; Novferma, 2016). Research also shows that self-efficacy, or students' belief in their ability to solve math problems, is closely linked to their success (Bruno et al., 2021; Novferma, 2016). The final factor contributing to students' difficulties is pedagogical. Ineffective or inappropriate teaching methods can affect students' problem-solving skills (Permata et al., 2022).

Arithmetic sequences and series are some of the more challenging topics for students in high school mathematics (Hidayat et al., 2022; Kurniasari et al., 2022). Understanding arithmetic sequences and series is essential in developing students' mathematical mindset, with relevance to more complex problem-solving skills needed for advanced studies in science, technology, and economics (Shah, 2024). A solid grasp of these concepts helps students recognize numerical patterns and understand more advanced algebraic functions (Khoirunnisa et al., 2024). However, many students need help solving arithmetic sequence and series problems, particularly when presented as word problems requiring structured problem-solving strategies (Kurniasari et al., 2022). These difficulties are often due to challenges applying relevant mathematical concepts (Qolbi et al., 2022), leading to reading, comprehension, and encoding errors during problem-solving (Afifah et al., 2022).

Observations at a high school in Indonesia revealed that many students struggle to solve arithmetic sequence and series problems. According to the teacher, students frequently must correct their errors despite exploring similar examples in class. Therefore, it is necessary to investigate students' difficulties when learning about arithmetic sequences and series.

Several studies have examined mathematical problem-solving on arithmetic sequences and series. Hayati conducted quantitative research and found that Problem-Based Learning (PBL) significantly improved student learning outcomes, including critical thinking and learning enjoyment (Hayati et al., 2024). Pirmanto qualitatively analyzed students' difficulties using Polya's problem-solving framework and discovered that students had low abilities in understanding, planning, solving, and reviewing their solutions (Pirmanto et al., 2020). Aini analyzed students' mathematical investigation abilities and found that their numerical skills greatly affected their accuracy and consistency in solving arithmetic sequence and series problems (Aini et al., 2024). Noer used Newman's framework to analyze errors in solving sequence and series problems, identifying problem comprehension and transformation as the most common error stages (Noer et al., 2023).

Based on these findings, a research gap exists at the school studied, where student difficulties can be analyzed using Newman's perspective. The uniqueness of this research lies in its role as an initial study designed to inform specific and measurable learning interventions for students. Therefore, this study investigated students' difficulties in solving arithmetic sequence and series problems using Newman's framework. Newman's indicators were selected because they provide a more detailed problem-solving process than other models (Oktaviani et al., 2021).

II. METHOD

This research employs a descriptive qualitative method to describe and analyze the difficulties faced by 10th-grade high school students in solving arithmetic sequence and series problems. The qualitative method was chosen because it allows for an in-depth exploration of the characteristics of students' problem-solving errors and provides insights into how students organize and convey mathematical concepts in writing. Based on Newman's indicators, this study describes students' experiences, understanding, and strategies for solving arithmetic sequence and series problems.

The study was conducted at a high school in Indonesia, located in the archipelago, specifically in Kolaka Regency, Southeast Sulawesi. The school is one of the most popular schools, with a diverse student body. The research participants were selected using purposive sampling from 10th-grade students based on their varying levels of mathematical ability, including high, medium, and low performers. A total of 3 students were chosen from 33, with the selection aimed at ensuring

that these participants could provide relevant and in-depth information aligned with the research objectives.

Data collection involved the use of problem-solving tasks and semi-structured interviews. The tasks consisted of three questions related to arithmetic sequences and series, designed to assess students' mathematical problem-solving abilities based on Newman's error analysis framework, which includes the stages of reading, comprehension, transformation, process skills, and encoding. These instruments were intended to capture both students' procedural fluency and their conceptual understanding. After completing the tasks, students participated in individual interviews to elaborate on their responses and explain their reasoning at each stage of problem-solving. During this process, the researcher also conducted direct observations and took field notes to document students' behavior, expressions, and signs of difficulty that might not be explicitly revealed in written or verbal responses. These various sources of data—written answers, interview transcripts, and observational notes—served as the foundation for the subsequent analysis.

The collected data were analyzed using analytical techniques, including data presentation, reduction, interpretation, and conclusion drawing (Miles et al., 2014). During the data presentation phase, the results of the problem-solving tasks and student interviews were categorized based on mathematical procedural ability. Data reduction involved selecting and sorting the information most relevant to the research objectives. Data interpretation was conducted by narratively communicating the findings and analysis. Finally, conclusions were drawn by examining the relationships between the categories and interpreting the data in light of the procedural ability framework. To enhance the validity of the results, data triangulation was applied by comparing and cross-verifying data obtained from different sources. Specifically, student responses to problem-solving tasks were compared with their explanations during interviews, while observational notes were used to contextualize students' reasoning. This triangulation process contributed to a more accurate and comprehensive understanding of students' procedural difficulties.

III. RESULTS AND DISCUSSION

A. Results

This study explored the difficulties faced by 10th-grade students in solving arithmetic sequence and series problems using Newman's approach. Based on the data analysis from problem-solving tasks and student interviews, the characteristics of these difficulties were identified, as presented in Table 1.

Table 1. Characteristics of Student Difficulties

Category	Characteristics Based on Ability		
	S-01 (High)	**S-02 (Moderate)**	**S-03 (Low)**
Reading	Able to read the problem correctly, understand the meaning of the symbols, and grasp the intent of the problem.	Able to understand the problem but misinterprets some of the symbols provided.	Unable to read the problem correctly and struggles to interpret the problem.
Understanding the Problem	Fully understands the problem and can correctly identify and write down the given and required information.	Requires more effort to understand the problem and makes errors when writing the given and required information in symbolic form.	Fails to understand the problem and cannot correctly identify or write down the given and required information.
Transformation	Knows and applies the correct process or algorithm to solve the problem.	Knows the process or algorithm but fails to consistently follow through the problem-solving steps.	Struggles to determine the correct algorithm and uses incorrect approaches in problem-solving.
Process Skills	Understands the concept, formula, and problem-solving process and successfully executes the solution steps.	Unable to properly process the problem-solving steps, despite knowing the correct formula.	Makes errors in the solution process, even though the correct formula is used.
Encoding	Successfully solves the problem and writes the correct and clear solution.	Inconsistent in solving problems, often due to limited understanding.	Unable to solve the problem, attributing it to mere memorization of formulas without understanding the underlying concepts.

Based on Table 1, it was found that the high-ability S-01 did not experience any difficulties and solved the problem effectively. S-01 could read the problem accurately, understand its meaning, and correctly write the known and required information. Additionally, S-01 identified the appropriate algorithm, followed the problem-solving steps systematically, and arrived at the correct solution, demonstrating mature problem-solving skills and an accurate application of arithmetic sequence and series concepts.

On the other hand, the medium-ability S-02 encountered difficulties at certain stages of problem-solving. While S-02 generally understood the problem, there needed improvement in interpreting symbols and writing information in mathematical form. In addition, there needs to be more consistency in the process skills in S-02 to prevent errors in answers. As a result, S-02 needs to struggle to consistently find the correct solution despite familiarity with the relevant formulas and

concepts. This issue is illustrated in one of the student's answers to the third problem, as shown in Figure 1.

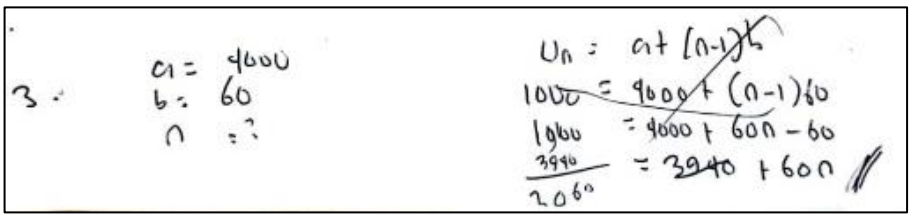

Figure 1. S-02's Answer

Based on Figure 1, S-02 made errors in the transformation and process skills categories. Although S-02 correctly wrote the known information and the question, they needed help to apply the arithmetic sequence and series formula, which led to an incorrect solution. Scribbles in the solution steps further indicated confusion. The interview confirmed that S-02 felt uncertain about the problem-solving process, even though they had memorized the formula. This confusion prevented S-02 from transforming the understood information into the correct mathematical concept, leading to errors up to the encoding stage.

In contrast, the low-ability S-03 experienced significant difficulties at every problem-solving stage. S-03 could not read or understand the problem clearly, failing to identify key information. This difficulty persisted in the transformation stage, where S-03 struggled to determine the appropriate algorithm and often attempted incorrect solutions. Furthermore, despite knowledge of the formula, the solution process must align with the given concept or formula. Ultimately, S-03 could not reach the correct solution, explaining that they had memorized the formula without truly understanding it. This issue is illustrated in one of the student's answers to the first problem, as shown in Figure 2.

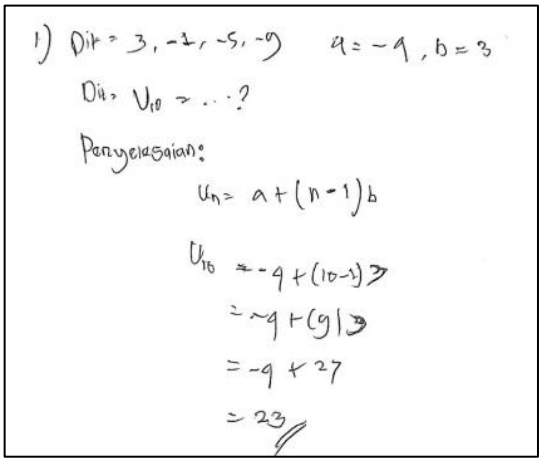

Figure 2. S03's Answer

Based on Figure 2, students needed help understanding the first question. This difficulty is evident from the student's answer, where the values of variables a and b were written interchangeably. This finding indicates a mistake in transforming the information provided in the question. As a result, errors also occurred in the problem-solving and encoding processes. According to the interview, S-03 admitted having trouble understanding the question and could not identify the known information. S-03 also stated that the answers were based on memorized mathematical concepts rather than genuine understanding. S-03 could memorize the concepts but needed to comprehend their meaning fully.

The findings show that students' difficulties in solving arithmetic sequence and series problems vary according to their ability levels. Additionally, these challenges are influenced by their capacity to understand and apply mathematical concepts. The most common difficulties were understanding the question, transformation, process skills, and encoding, particularly among students with medium and low abilities. In contrast, high-ability students were able to solve the questions easily.

B. Discussion

The research findings revealed that most students encountered difficulties at various stages of Newman's problem-solving model: reading, understanding, transformation, process skills, and encoding. These results align with previous studies, which indicate that solving mathematical problems is a complex process involving metacognitive, cognitive, and affective factors (Scheibe et al., 2023). At the reading stage, the high-ability S-01 could read the problem accurately, comprehend the symbols, and understand the problem's meaning. The medium-ability S-02 demonstrated a less accurate understanding of the symbols, while the low-ability S-03 struggled significantly with reading and interpreting the problem. These findings are consistent with Rohmah and Sutiarso, and Swari, who noted that errors at the reading stage occur when students fail to identify basic information in the problem (Rohmah & Sutiarso, 2018; Swari et al., 2020). Similarly, research by Nahdi, et al. emphasized that poor reading comprehension is a major factor in students' difficulties in solving math problems (Nahdi et al., 2023).

The understanding stage was the next critical point. S-01 could correctly identify and write the known and required information. However, S-02 made mistakes in recording the given information, and S-03 needed to have understood the problem entirely. Research by Özcan and Doğan supports these findings, showing that errors in understanding problems are often due to limitations in reading comprehension skills (Özcan & Doğan, 2018). This finding aligns with Noer et all (Noer et al., 2023), who found that the most common error in solving arithmetic sequence and series problems occurred during the problem comprehension stage (Noer et al., 2023).

The transformation stage presented a significant challenge, particularly for S-02 and S-03. While S-01 applied the correct algorithm, S-02 knew the appropriate method but failed to apply it consistently. S-03 struggled to identify the correct algorithm and often used incorrect approaches to solve the problem. This finding is supported by Krawitz, et al. and Reyes-Huerta who found that many students struggle to convert verbal problems into appropriate mathematical models (Krawitz et al., 2022; Reyes-Huerta et al., 2024). The transformation stage is crucial in problem-solving, as students must accurately translate verbal information into symbolic or mathematical form (Swari et al., 2020).

S-01 successfully executed the problem-solving steps at the process skills stage, from using the correct concepts to applying the appropriate formula. However, S-02, despite knowing the correct formula, needed help to process the given information properly. Meanwhile, S-03 made calculation errors despite using the correct formula. Research by Jitendra et al. indicates that errors at this stage are often due to inaccuracies or incorrect algorithm application, even when students have selected the correct method (Jitendra et al., 2016). This reinforces the idea that process skill errors are not just about algorithm choice but also involve accurately carrying out mathematical procedures (Daswarman, 2020; Syarnubi et al., 2024).

In the final stage, S-01 successfully completed the encoding stage by presenting the solution clearly and correctly. In contrast, S-02, although demonstrating understanding of the problem and using the correct formula, was inconsistent in solving all problems accurately. Meanwhile, S-03 was unable to complete the task, admitting to having only memorized the formula without fully understanding it. This error at the encoding stage underscores the importance of mathematical communication skills in effectively conveying solutions (Schoenfeld, 2016). Encoding errors often occur when students struggle to articulate their final answers clearly, even after successfully completing the previous problem-solving stages.

The results showed that students' difficulties in solving arithmetic sequence and series problems were largely influenced by their mathematical abilities, problem comprehension, and mastery of relevant mathematical concepts. These results align with the findings of Bruno et al., which state that challenges in solving mathematical problems stem from a need for more conceptual and procedural knowledge (Bruno et al., 2021). Additionally, metacognitive skills—such as planning, monitoring, and evaluating problem-solving strategies—play a crucial role in successful problem-solving (Aprilia et al., 2021). From an affective perspective, students' motivation and attitudes toward mathematics also affect their problem-solving performance. Students with low motivation or negative attitudes experience more difficulties (Jatmiko, 2018). Furthermore, research indicates that students' self-efficacy, or belief in their ability to solve math problems, is closely linked to their success (Bruno et al., 2021).

IV. CONCLUSIONS AND SUGGESTIONS

A. Conclutions

This study explored the difficulties experienced by Grade 10 students in solving arithmetic sequence and series problems through the lens of Newman's error analysis procedure. The findings revealed that students encountered challenges at every stage of problem-solving—beginning from reading and understanding the problem, continuing through transformation and process skills, and culminating in the encoding stage. Students with high mathematical ability demonstrated proficiency across all stages, while those with medium and low abilities struggled, especially during the comprehension, transformation, and encoding phases. A notable and recurring difficulty involved transforming verbal or contextual information into appropriate mathematical expressions. This indicates a significant gap in students' conceptual understanding and their ability to model problems mathematically. Additionally, some students applied correct formulas but did so incorrectly, suggesting a lack of self-awareness in their problem-solving processes. Particularly for low-ability students, the challenge lay not in identifying what the question was asking, but in converting that information into a solvable mathematical model.

B. Suggestions

Despite its valuable insights, the study has several limitations. The most significant is the small sample size, which included only three students, restricting the generalizability of the results. Furthermore, the focus on arithmetic sequences and series limits the applicability of the findings to other mathematical domains. The study also did not account for affective dimensions such as students' motivation, attitudes, or anxiety, which may influence their cognitive performance during problem-solving.

To address these limitations, future research should involve a larger and more diverse sample, as well as explore various mathematical topics. It is also essential to incorporate affective and metacognitive variables to provide a more comprehensive understanding of students' difficulties. In terms of educational implications, targeted intervention programs that integrate structured problem-solving frameworks—such as Problem-Based Learning (PBL) or metacognitive training—are recommended to help students develop stronger reasoning and procedural skills.

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REFERENCES

Afifah, A., Darmayanti, R., Sugianto, R., Choirudin, C., & Putra, F. G. (2022). How Does Newman Analyze Student Errors When Solving BADER Story Problems? *AMCA Journal of Religion and Society*, *2*(2). https://doi.org/10.51773/ajrs.v2i2.275

Aini, L. N., Subarinah, S., & Prayitno, S. (2024). Kemampuan Investigasi Matematika pada Materi Barisan dan Deret Ditinjau dari Kemampuan Numerik Siswa. *Journal of Classroom Action Research*, *6*(2), 303–312. https://doi.org/10.29303/jppipa.v6i2.7568 Received

Aprilia, L., Anriani, N., & Rafianti, I. (2021). Analisis Kesulitan Siswa dalam Menyelesaikan Soal Pemecahan Masalah Ditinjau dari Kesadaran Metakognisi Siswa. *Jurnal Inovasi dan Riset Pendidikan Matematika*, *2*(1). https://jurnal.untirta.ac.id/index.php/wilangan/article/view File/11572/7575

Bruno, A., Qohar, A., Susanto, H., & Permadi, H. (2021). Kesulitan Siswa dalam Pemecahan Masalah Soal Cerita Matematika Dilihat dari Adversity Quotient (AQ). *Edumatica: Jurnal Pendidikan Matematika*, *11*(03), 91–103. https://doi.org/10.22437/edumatica.v11i03.15395

Daswarman, D. (2020). Analisis Kesalahan Mahasiswa dalam Menyelesaikan Soal Matematika Ditinjau dari Prosedur Newman. *Jurnal Eksakta Pendidikan (JEP)*, *4*(1), 73-80. https://doi. org/10.24036/jep/vol4-iss1/435

Hadi, S. (2019). Analisis Kesulitan dan Self-Efficacy Siswa MA dalam Pemecahan Masalah Matematika. *JUPE : Jurnal Pendidikan Mandala*, *4*(4). https://doi.org/10.58258/jupe.v4i4. 1312

Hayati, F., Saragih, S. D., & Gunarto, B. (2024). Analisis Kesulitan Belajar Siswa pada Materi Barisan dan Deret Menggunakan Metode Problem Based Learning. *Innovative: Journal of Social Science Research*, *4*(2), 3335–3346. https://doi.org/10.31004/innovative.v4i2.9727

Hidayat, W., Rohaeti, E. E., Ginanjar, A., & Putri, R. I. I. (2022). An Epub Learning Module and Students' Mathematical Reasoning Ability: A Development Study. *Journal on Mathematics Education*, *13*(1), 103–118. https://doi.org/10.22342/jme.v13i1.pp103-118

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

Jatmiko, J. (2018). Kesulitan Siswa dalam Memahami Pemecahan Masalah Matematika. *Jurnal Ilmiah Pendidikan Matematika*, *3*(1), 17–20. https://doi.org/10.26877/jipmat.v3i1.2285

Jitendra, A. K., Nelson, G., Pulles, S. M., Kiss, A. J., & Houseworth, J. (2016). Is Mathematical Representation of Problems an Evidence-Based Strategy for Students with Mathematics Difficulties? *Exceptional Children*, *83*(1), 8–25. https://doi.org/10.1177/0014402915625062

Khesya, N., & Ananda, R. (2024). Pengaruh Self-Concept dan Self-Efficacy terhadap Kemampuan Pemecahan Masalah Matematis Siswa Kelas IX. *Histogram: Jurnal Pendidikan Matematika*, *8*(2), 12–22. https://doi.org/10.31100/histogram.v8i2.3829

Khoirunnisa, H., Rahmawati, E., Husein, M. A., & Mahmudah, U. (2024). Analisis Kemampuan Matematis Mahasiswa pada Bilangan Kompleks melalui Perspektif Barisan dan Deret. *Jurnal Pendidikan Sultan Agung*, *4*(2), 122–130. http://doi.org/10.30659/jp-sa.v4i2.37746

Krawitz, J., Chang, Y. P., Yang, K. L., & Schukajlow, S. (2022). The Role of Reading Comprehension in Mathematical Modelling: Improving the Construction of A Real-World Model and Interest in Germany and Taiwan. *Educational Studies in Mathematics*, *109*(2), 337–359. https://doi.org/10.1007/s10649-021-10058-9

Kurniasari, C., Hidajat, D., & Handayani, Y. A. (2022). Analisis Kesulitan Menyelesaikan Soal Cerita Materi Barisan dan Deret Aritmetika dengan Indikator Polya pada Siswa Kelas X. *Numeracy*, *9*(2), 122–137. https://doi.org/10.46244/numeracy.v9i2.1959

Kurniawati, I., Raharjo, T. J., & Khumaedi. (2019). Peningkatan Kemampuan Pemecahan Masalah untuk Mempersiapkan Generasi Unggul Menghadapi Tantangan abad 21. *Seminar Nasinal Pascasarjana*, *21*(2), 701-707. https://proceeding.unnes.ac.id/snpasca/article/view/360

Liljedahl, P., Santos-Trigo, M., Malaspina, U., & Bruder, R. (2016). *Problem Solving in Mathematics Education*. Springer Nature. https://doi.org/10.1007/978-3-319-40730-2

Logistica, R. S. A., & Awalludin, S. A. (2024). Analysis of Students' Errors in Solving Literacy and Numeracy Problems: a Newman Procedure Approach. *MaPan: Jurnal Matematika dan Pembelajaran*, *12*(1), 47–63. https://doi.org/10.24252/mapan.2024v12n1a4

Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative Data Analysis A Methods Sourcebook Edition 3*. SAGE Publications, Inc.

Nahdi, D. S., Cahyaningsih, U., Jatisunda, M. G., & Rasyid, A. (2023). Mathematics Interest and Reading Comprehension as Correlates of Elementary Students' Mathematics Problem-Solving Skills. *Edukasiana: Jurnal Inovasi Pendidikan*, *3*(1), 115–127. https://doi.org/10.56916/ejip.v3i1.510

Noer, S. F., Sugandi, A. I., & Amelia, R. (2023). Analisis Kesalahan dalam Soal-Soal Pemecahan Masalah Siswa SMA Kelas XI pada Materi Barisan dan Deret Aritmatika Ditinjau dari Teori Newman. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, *6*(4), 1369–1378. https://doi.org/10.22460/jpmi.v6i4.17677

Novferma, N. (2016). Analisis Kesulitan dan Self-Efficacy Siswa SMP dalam Pemecahan Masalah Matematika Berbentuk Soal Cerita. *Jurnal Riset Pendidikan Matematika*, *3*(1), 76–87. https://doi.org/10.21831/jrpm.v3i1.10403

Oktaviani, H., Kintoko, K., & Suprihatiningsih, S. (2021). Analisis Kesalahan Newman pada Pemecahan Masalah Siswa Kelas VII SMP N 15 Yogyakarta. *Riemann: Research of Mathematics and Mathematics Education*, *3*(1), 1–8. https://doi.org/10.38114/riemann.v3i1.106

Özcan, Z. Ç., & Doğan, H. (2018). A Longitudinal Study of Early Math Skills, Reading Comprehension and Mathematical Problem Solving. *Pegem Egitim ve Ogretim Dergisi*, *8*(1), 1–18. https://doi.org/10.14527/pegegog.2018.001

Permata, E. I., Sunandar, & Endahwuri, D. (2022). Analisis Kemampuan Siswa dalam Memecahkan Masalah Matematika Berdasarkan Gaya Belajar Siswa. *Imajiner: Jurnal Matematika dan Pendidikan Matematika*, *5*(1), 130–144. https://doi.org/10.31537/laplace.v5i1.678

Pirmanto, Y., Anwar, M. F., & Bernard, M. (2020). Analisis Kesulitan Siswa SMA dalam Menyelesaikan Soal Pemecahan Masalah pada Materi Barisan dan Deret dengan Langkah-Langkah Menurut Polya. *Jurnal Pembelajaran Matematika Inovatif*, *3*(4), 371–384. https://doi.org/10.22460/jpmi.v3i4.371-384

Pratiwi, I. C., Lefrida, R., Alfisyahra, & Pathuddin. (2024). Profil Pemecahan Masalah Aritmatika Sosial Ditinjau dari Gaya Kognitif Field Independent. *Histogram: Jurnal Pendidikan Matematika*, *8*(1), 37–48. https://journal.matappa.ac.id/index.php/histogram/article/view/3403

Qolbi, G., Dewi, P. A., Sholiha, S., Pangestu, T. A., & Fu'adin, A. (2022). Analysis of Students' Mathematical Understanding on Arithmetic Sequences and Series in 12th Grade Senior High School. *Brillo Journal*, *2*(1), 13–21. https://doi.org/10.56773/bj.v2i1.24

Ramadhani, D. A., & Hakim, D. L. (2021). Kemampuan Problem-Solving Matematis Siswa SMA dalam Menyelesaikan Permasalahan Materi Fungsi. *Jurnal Pembelajaran Matematika Inovatif*, *4*(5), 1113–1122. https://doi.org/10.22460/jpmi.v4i5.1113-1122

Reyes-Huerta, V., Juárez-López, J. A., & Iglecias-Antonio, R. (2024). Exploring Difficulties in Textual Understanding of Mathematical Word Problems from a Psycholinguistic Perspective and Use of Drawings. *International Journal of Indonesian Education and Teaching*, *8*(2), 346–354. https://doi.org/10.24071/ijiet.v8i2.8161

Rohmah, M., & Sutiarso, S. (2018). Analysis Problem Solving in Mathematical Using Theory Newman. *Eurasia Journal of Mathematics, Science and Technology Education*, *14*(2), 671–681. https://doi.org/10.12973/ejmste/80630

Scheibe, D. A., Was, C. A., Dunlosky, J., & Thompson, C. A. (2023). Metacognitive Cues, Working Memory, and Math Anxiety: The Regulated Attention in Mathematical Problem Solving (RAMPS) Framework. *Journal of Intelligence*, *11*(6). https://doi.org/10.3390/jintelligence 11060117

Schoenfeld, A. H. (2016). Learning to Think Mathematically: Problem Solving, Metacognition, and Sense Making in Mathematics. *Journal of Education*, *196*(2), 1–38. https://doi.org/ 10.1177/002205741619600202

Setyaningrum, D. A., Sabil, H., & Kumalasari, A. (2024). Pengembangan E-Modul Interaktif Berbasis Steam Materi PLSV untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis Siswa. *Jurnal Ilmiah Matematika Realistik*, *5*(1), 117–127. https://doi.org/ 10.33365/ji-mr.v5i1.5091

Shah, Y. P. (2024). An Analysis of Sequence and Series. *Historical Journal*, *15*(1), 40–44. https://doi.org/10.3126/hj.v15i1.63974

Sinaga, B., Sitorus, J., & Situmeang, T. (2023). The Influence of Students' Problem-Solving Understanding and Results of Students' Mathematics Learning. *Frontiers in Education*, *8*(February), 1–9. https://doi.org/10.3389/feduc.2023.1088556

Siswanto, E., & Meiliasari, M. (2024). Kemampuan Pemecahan Masalah pada Pembelajaran Matematika: Systematic Literature Review. *Jurnal Riset Pembelajaran Matematika Sekolah*, *8*(1), 45–59. https://doi.org/10.21009/jrpms.081.06

Swari, C. D. V. S., Mardiyana, & Indriati, D. (2020). Analysis of Mathematical Problem Solving Based on Stages Newman in Equality and Inequality One Variable. *Journal of Physics: Conference Series*, *1511*(1). https://doi.org/10.1088/1742-6596/1511/1/012094

Syarnubi, Efriani, A., Pranita, S., Zulhijra, Anggara, B., Alimron, Maryamah, & Rohmadi. (2024). An Analysis of Student Errors in Solving HOTS Mathematics Problems Based on the Newman Procedure. *The 2nd Young Scholar Symposium on Science and Mathematics Education, and Environment*, *3058*, 60013. https://doi.org/10.1063/5.0201077

Szabo, Z. K., Körtesi, P., Guncaga, J., Szabo, D., & Neag, R. (2020). Examples of Problem-Solving Strategies in Mathematics Education Supporting the Sustainability of 21st-Century Skills. *Sustainability (Switzerland)*, *12*(23), 1–28. https://doi.org/10.3390/su122310113

Tambunan, H. (2018). Impact of Heuristic Strategy on Students' Mathematics Ability in High Order Thinking. *International Electronic Journal of Mathematics Education*, *13*(3), 321–328. https://doi.org/10.12973/iejme/3928

Tambunan, H. (2020). Kemampuan Siswa dalam Pemecahan Masalah Matematika dengan Strategi Heuristik. *Sepren, 1*(2), 28–33. https://doi.org/10.36655/sepren.v1i02.209

Tika, N. W., Rahayu, W., & Hidajat, F. A. (2024). Pengembangan Modul Ajar Matematika Berbasis Integrasi PbL-STEM pada Kurikulum Merdeka untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis Siswa. *Histogram: Jurnal Pendidikan Matematika, 8*(2), 70–85. https://doi.org/10.31100/histogram.v8i2.3803

Wahidah, Y. N., Inganah, S., & Ismail, A. D. (2017). The Analysis of Mathematical Problems Using Newman Stages Reviewed from Emotional Intelligence. *Mathematics Education Journal, 1*(2), 56-62. https://doi.org/10.22219/mej.v1i2.4630