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STUDENTS' CRITICAL THINKING SKILLS IN SOLVING HOTS-ORIENTED NUMERACY PROBLEMS

Putri Nur Habibah[1*], Christina Kartika Sari[2]
[1,2]Mathematics Education, Universitas Muhammadiyah Surakarta, Center Java, Indonesia
*Correspondence: a410210089@ums.ac.id

ABSTRACT
Critical thinking skills are the expected outcome of the student learning process and are a means to support student growth and development. This study aims to present the results of the analysis of the critical thinking ability process of grade X students with high, medium, and low initial abilities in solving HOTS-oriented numeracy problems on the Three-Variable Linear Equation System material and to determine students' critical thinking abilities in each critical thinking indicator. HOTS-oriented numeracy problems are numeracy problems designed to develop students' high-level thinking skills. These questions require students to analyze, evaluate, and create solutions based on deep understanding. The type of research used in this study is qualitative research with a descriptive approach. The subjects of this study were six students with varying initial abilities. Sampling in this study used random samling technique. Data collection techniques were carried out through tests, interviews, and documentation. The results and conclusions of this study showed a relationship between student abilities and the level of critical thinking indicators. Students with high initial abilities tend to be able to meet all critical thinking indicators, while students with moderate and low initial abilities experience various obstacles in several aspects.
Keywords: Critical Thinking, Numeracy, HOTS, Initial Abilities

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PRELIMINARY

Mathematics is a subject that has been introduced and taught at all levels of education. Apart from that, mathematics also shapes human thought patterns, especially in dealing with problems in everyday life, such as logical thinking, analytical thinking, systematic thinking, critical thinking, innovative thinking, creative thinking, and the ability to work together in solving problems. Mathematics equips students to think logically, analytically, systematically, and critically and work together (Rahimah, 2019). Therefore, mathematics is taught to know and understand what is contained in it and to train students' thinking patterns so they can solve problems critically, analytically, logically, and systematically.

According Hidayat & Sari (2019), critical thinking skills are needed to solve daily problems. Critical thinking is a form of thinking used to solve a problem. Students' critical thinking skills are essential to understanding and solving a problem or mathematical problem

that requires reasoning, analysis, evaluation, and interpretation of thought. Critical thinking skills are one of the crucial aspects that students need in the mathematics learning process, significantly to help students solve complex mathematical problems (Duri et al., 2021). Critical thinking skills will help students improve their mathematical problem-solving abilities. Mathematical problems require analysts to solve problems, such as making arguments from the solutions provided so students can think critically (Aditama et al., 2023).

Critical thinking is crucial in solving numeracy problems (Diana & Saputri, 2022). Numeracy is the ability to think and use concepts, procedures, facts, and mathematical tools to solve everyday contextual problems. Numeracy is essential because it involves mathematical knowledge and its application to real-world situations. Rogers (2019) states that to solve numeracy problems, students need more than just basic mathematical skills; they must understand and relate mathematical skills to various contexts and situations. Numeracy skills help train individuals to solve problems, understand the information presented in tables or graphs, and analyze data to make decisions. This allows individuals to face various challenges in life. Numeracy skills that involve high-level thinking skills or problems given based on higher-order thinking Skills (HOTS) questions (Sanvi, 2022).

One problem-solving approach involves using higher-order and higher-order thinking skills (HOTS) and critical thinking abilities. Higher-order thinking Skills (HOTS) are thinking skills that are more than just memorizing facts and concepts. Students must understand each other, analyze, classify, manipulate, create new creative methods, and apply them to solve new problems (Mulyawan et al., 2023). Higher Order Thinking Skills (HOTS) is the ability to think more complexly in dealing with issues or concerns, such as the ability to analyze (C4), evaluate (C5), and create (C6) in the subtle thinking dimensions of Bloom's Taxonomy. The main goal of higher-order thinking skills is to improve students' critical thinking abilities at a higher level. This is mainly related to the ability to think critically when receiving various information, think creatively when solving problems using their knowledge, and make decisions in complex situations (Sriyanti et al., 2022).

One of the materials related to everyday life in mathematics is the System of Linear Equations with Three Variables (SPLTV). It is mandatory material in mathematics that class X students must study. The SPLTV material transitions from the system with two variables (SPLDV) that students have studied at the junior high school level. By understanding SPLDV material, students can understand the SPLTV material. According to Zakiyah et al. (2019), students with a good understanding of SPLDV material are likelier to understand SPLTV well. However, SPLTV material is still complex for students because the long

completion process requires a lot of time. In general, SPLTV material is in the form of story questions because this material is very closely related to everyday life. The basic competency contained in this SPLTV material is compiling and solving contextual problems with SPLTV. Based on the essential competencies in this material, students are expected to have good problem-solving skills to solve issues contained in the System of Three Variable Linear Equations (SPLTV) material (Akhyar & Senjayawati, 2023).

Critical thinking skills can be integrated with solving Higher Order Thinking Skills (HOTS) problems related to the Three Variable Linear Equation System (SPLTV) by analyzing the problem in depth, evaluating various solution methods, and interpreting the results logically. Students must be able to identify important information, build appropriate mathematical models, and choose efficient solution strategies, such as substitution, elimination, or matrix methods. In addition, they need to test the correctness of the solution by considering the context of the problem, so that they can draw appropriate and relevant conclusions in real life.

According to Purnamasari & Setiawan (2019), students' initial abilities are abilities that students previously possessed before receiving learning. Students' initial abilities are the basic knowledge teachers can use to predict student achievement in the learning process. Students with high abilities tend to face fewer problems in learning than those with moderate or low abilities (Setiana et al., 2021). Thus, students' initial abilities can be interpreted as their skills or mastery of mathematics before learning new material (Dewi & Machromah, 2022).

Students' initial skill level (high, medium, low) has a significant influence on their critical thinking ability in solving HOTS-oriented mathematical problems. Students with high initial skills generally find it easier to recognize problems, analyze information, and develop logical and systematic solutions. They are also better able to evaluate various alternative solutions in more depth. Meanwhile, students with moderate initial skills can show quite good understanding, but often face difficulties in connecting concepts and making the right decisions. On the other hand, students with low initial skills often face obstacles in understanding problems, analyzing information, and formulating effective solution strategies, so they need more intensive guidance to develop students' critical thinking skills.

A lot of previous research on this topic has been carried out, so below, we will describe several things, including existing and non-existent findings from earlier research. Research conducted by Azvani Chaniago & Ajiz Awalludin (2024) shows that overall,

students with extroverted and introverted personality types can fulfill the four indicators of critical thinking abilities. Extroverted students excel at interpretation and analysis indicators, namely understanding and writing down the information in the problem and translating it into a mathematical model. However, extrovert students often make mistakes on evaluation indicators, namely being less careful in calculations and less accurate in concluding inference indicators. On the other hand, introverted students can fulfill the four indicators of mathematical critical thinking abilities and are much more thorough so that they can answer questions according to the aim and objectives of the questions. Research conducted by Widya et al. (2023) concluded that students with low self-efficacy abilities fulfill the indicators of interpretation, inference, evaluation, and explanation; students with moderate self-efficacy fulfill the indicators of interpretation, inference, evaluation, explanation, and self-regulation. Students with high self-efficacy fulfill all indicators of critical thinking, namely interpretation, analysis, inference, evaluation, explanation, and self-regulation. Besides, research conducted by Sintya & Sari (2024) can conclude that students with high self-confidence master all indicators of critical thinking, namely interpretation, analysis, evaluation, inference, explanation, and self-regulation. Students with moderate levels of self-confidence can master four indicators of critical thinking: interpretation, analysis, evaluation, and inference. Students with low self-confidence levels can only fulfill one indicator, namely interpretation.

Likewise, this research analyzes and describes students' critical thinking abilities in solving numeracy problems. However, the difference between the three studies above and this research is that the questions given in this study are HOTS-oriented numeracy questions related to daily life situations and are reviewed based on each category of students' pre-existing abilities. Therefore, this study aims to present the results of the analysis of the critical thinking abilities of students with high, moderate, and low initial abilities in solving HOTS-oriented numeracy problems and to determine students' critical thinking abilities for each critical thinking indicator.

METHODS

This study uses a qualitative research method with a descriptive approach. The purpose of this study is to explain students' critical thinking skills in solving numeracy problems oriented to Higher Order Thinking Skills (HOTS) related to a three-variable linear equation system, and to consider their initial competencies. This study was conducted at a state Vocational High School (SMK) in Central Java, with six students as participants.

Sampling in this study used random samling technique. The HOTS-oriented numeracy questions used in this study have been validated by a Mathematics Education lecturer from the Muhammadiyah University of Surakarta and a mathematics teacher from the SMK. After data collection, qualitative analysis was carried out according to the stages of the indicator process set by the researcher.

Data collection techniques in this study include tests, interviews, and documentation. The test measured students' abilities, knowledge, and skills in solving mathematical problems oriented toward Higher Order Thinking Skills (HOTS). The type of test used in this study was a written test using descriptive questions. Interviews were conducted directly by the researcher with mathematics teachers and several 10th-grade students majoring in marketing as their main study program. Interviews with six students aimed to evaluate their understanding of the questions in the written test and ensure that students could answer all questions independently according to their understanding. In addition, documentation includes data collection in the form of photographs during the interview process, activities during the exam, and other documents that support the results of the study. This documentation includes data collection from student work, interview photos, and so on. In this study, HOTS-oriented numeracy problems use descriptive questions.

Data analysis was carried out by analyzing the results of students' work based on five indicators of critical thinking according to Ennis (1985), namely: (1) explaining (elementary clarification), related to analytical skills in HOTS because it requires students to focus on questions, analyze arguments, and seek relevant information; (2) building basic skills (basic import), in line with evaluation in HOTS, because it involves considering the accuracy of sources and procedures used; (3) developing strategies and tactics (strategy and tactics), reflecting the creative aspect in HOTS, where students must determine steps and alternative solutions in solving problems; (4) concluding (inference), related to evaluation in HOTS because it requires students to assess the results of their thinking and consider the conclusions drawn; (5) providing further explanation (advance clarification), integrating all aspects of HOTS by requiring students to explain and develop thinking based on the conclusions made, thereby deepening students' understanding and critical thinking skills.

RESULT AND DISCUSSION

The following is a presentation of the analysis of student answers based on six subjects with categories: two students with high initial abilities, two students with moderate initial skills, and two students with low initial abilities with the following question format.

Question no. 1

Several activities were held at the school to commemorate SMA Suka Maju's anniversary, including a bazaar. One of the stands participating in the bazaar was the class XII MIPA 3. This stand sold rambutan shrimp, cheese shrimp, rissole, and several drinks. The food was sold in package form. The following is the price of each food package sold.

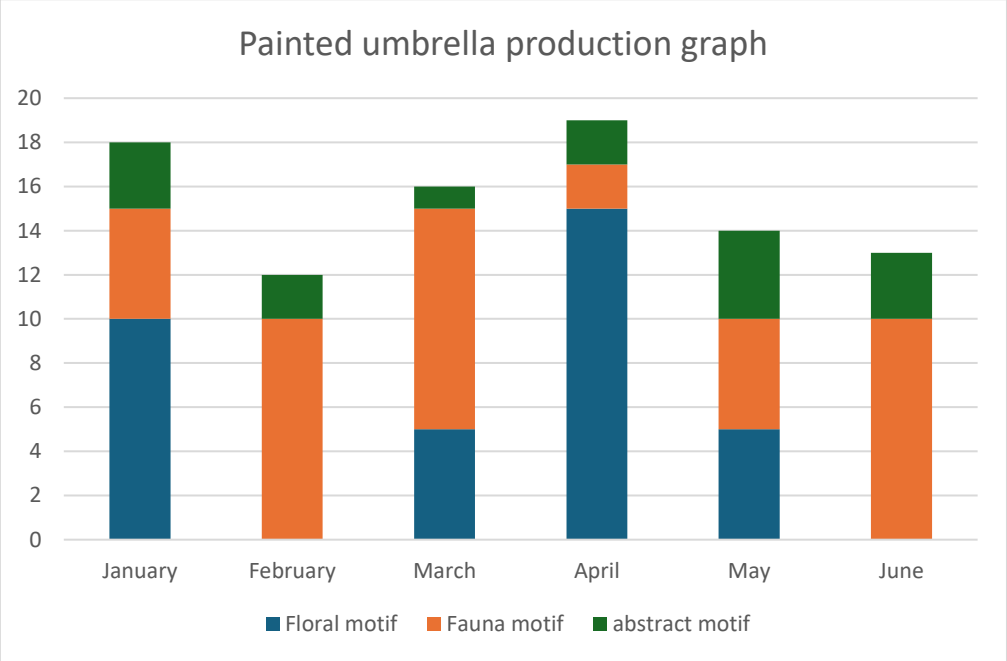
Mean Package Price List		
Happy Package	1 portion Risol 1 portion Rambutan Shrimp	Rp19.000,00
Bahagia Package	1 portion Risol 1 portion Cheese Shrimp	Rp24.000,00
Gembira Package	1 portion Risol 1 portion Cheese Shrimp 1 portion Rambutan Shrimp	Rp34.000,00

From the food package price list above, match the following foods with the money you must pay to buy them using the lines!

Food	**Money**
2 portions of rambutan shrimp and three portions of rissole	A. 45.000
3 portions of cheese shrimp and two portions of rambutan shrimp	B. 47.000
	C. 56.000
2 portions of rissole, four portions of rambutan shrimp, and one portion of cheese shrimp	D. 65.000
	E. 73.000

Question no. 2

Mr. Yanto is a painted umbrella craft entrepreneur in Juwiring. This umbrella craft business is a home industry that combines painting and handicrafts. Mr. Yanto creates umbrellas with various unique designs and patterns that are painted manually. One of the basic materials for making painted umbrellas is cloth. Mr. Yanto uses motifs to make painted umbrellas, including flora, fauna, and abstract motifs that reflect local culture. Using bright colors and detailed painting techniques gives this painted umbrella high artistic value. Mr. Yanto's painted umbrellas are popular with tourists and art collectors and are an alternative to typical souvenirs from Juwiring. Every month, Mr. Yanto produces painted umbrellas with various motifs. Production lots in the last six months are presented in the following graph.



Pak Yanto's total production time for the first three months follows.

Month	January	February	March
Total production time	29 days	26 days	28 days

a) Based on the discourse, put a √ mark on the statement below, which is correct!

- ☐ A. The time required to produce a painted umbrella with a floral motif is 1 day.
- ☐ B. The time needed to produce a printed umbrella with a fauna motif is 3 days.
- ☐ C. The time needed to produce a painted umbrella with an abstract motif is 5 days.
- ☐ D. The time required to produce painted umbrellas in May is 27 days.

b) Based on the graph and table above, if Pak Yanto wants to increase total production in the following month without increasing production time, what strategy can he use? Explain your reasons!

1. Critical thinking abilities of students with high initial abilities

Question no. 1

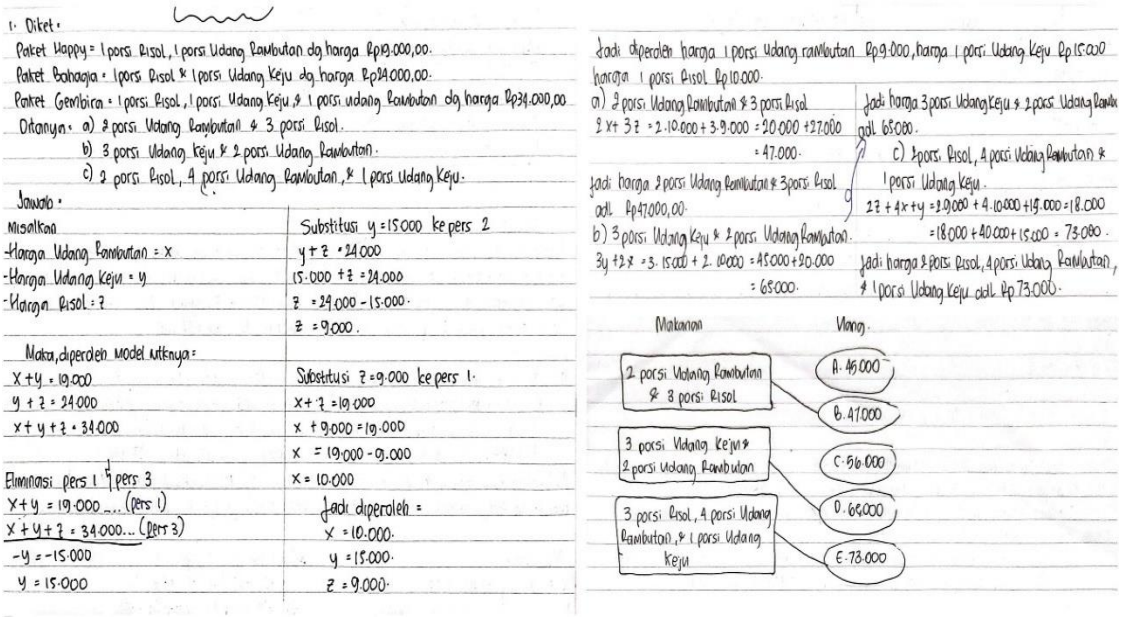


Figure 1. Student 1 of high initial ability

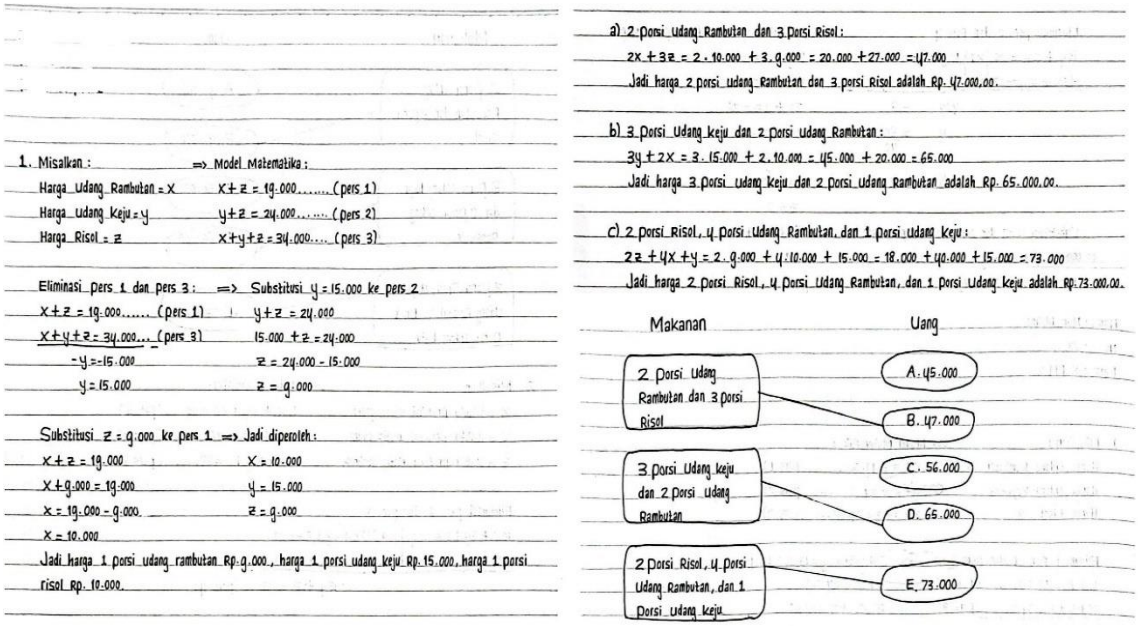


Figure 2. Student 2 of high initial ability

Based on the picture above, it can be seen that students with high initial abilities can fulfill all indicators of critical thinking skills for both HOTS-oriented numeracy questions regarding Systems of Linear Equations with Three Variables. The analysis of students' answers based on critical thinking ability indicators showed that only student 1 could fulfill the critical thinking ability indicators by providing a simple explanation (elementary clarification). In contrast, student 2 did not explain (elementary clarification). Student 2's

interview results showed, " I have not written down what is known and what is asked from the two questions because I am worried that there is not enough time, but I can explain what is known and what is asked about the question". Both students can fulfill the indicators of critical thinking ability, namely building basic skills (basic import), students can develop strategies and tactics (strategy and tactics), students can conclude (inference), and students can provide further explanations (advance clarification).

Question no. 2

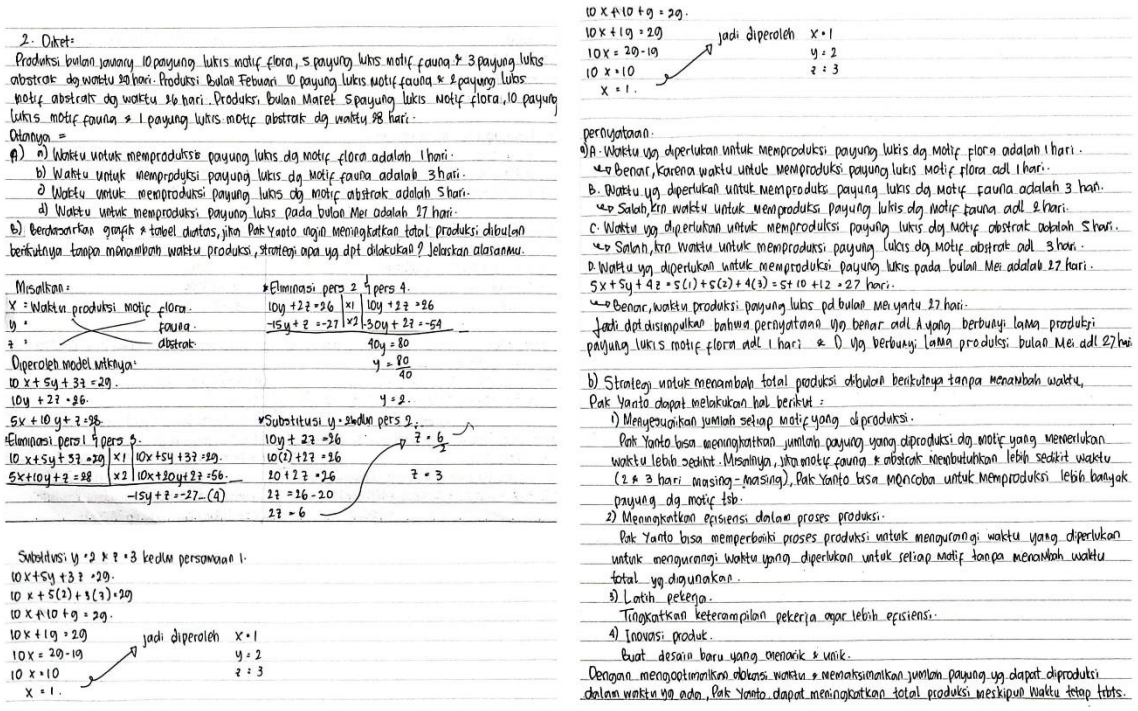


Figure 3. Student 1 of high initial ability

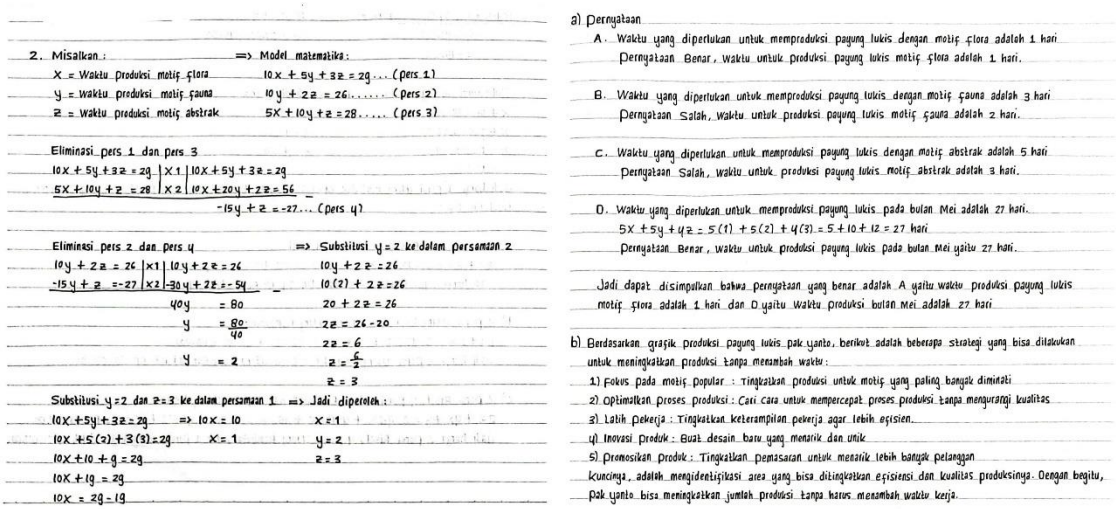


Figure 4. Student 2 of high initial ability

Based on the picture above, it can be seen that students with high initial abilities can fulfill all indicators of critical thinking skills for both HOTS-oriented numeracy questions regarding Systems of Linear Equations with Three Variables. The analysis of students' answers based on critical thinking ability indicators showed that only student 1 could fulfill the critical thinking ability indicators by providing a simple explanation (elementary clarification). In contrast, student 2 did not explain (elementary clarification). Student 2's interview results showed, "Similar to question number 1, I have not written down what is known and what is asked because I am worried that there is not enough time, but I can explain what is known and what is asked in the question". Both students can fulfill the indicators of critical thinking ability, namely building basic skills (basic import), students can develop strategies and tactics (strategy and tactics), students can conclude (inference), and students can provide further explanations (advance clarification).

2. Critical thinking abilities of students with moderate initial abilities

Question no. 1

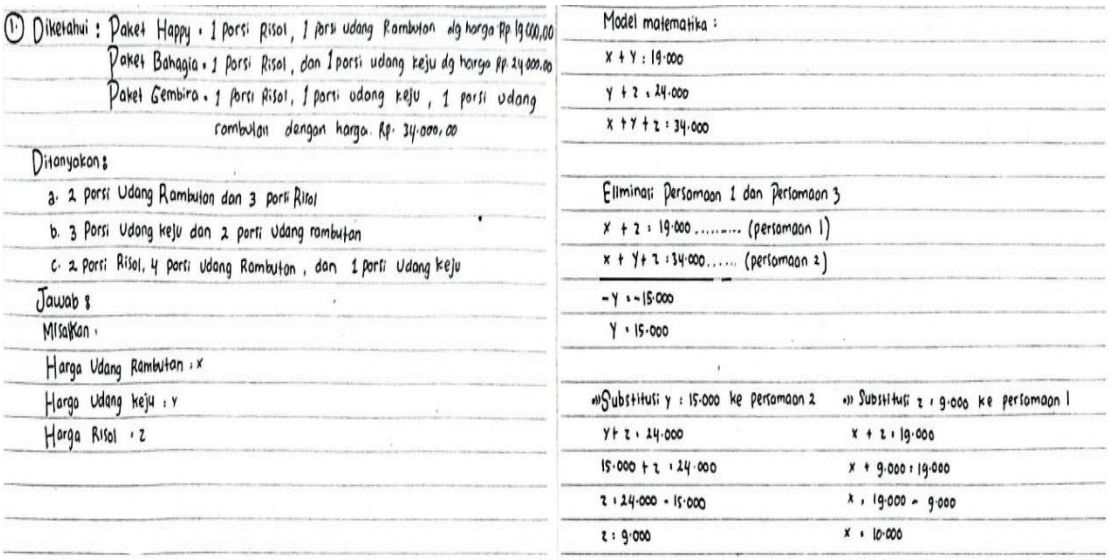


Figure 5. Student 3 of moderate initial ability

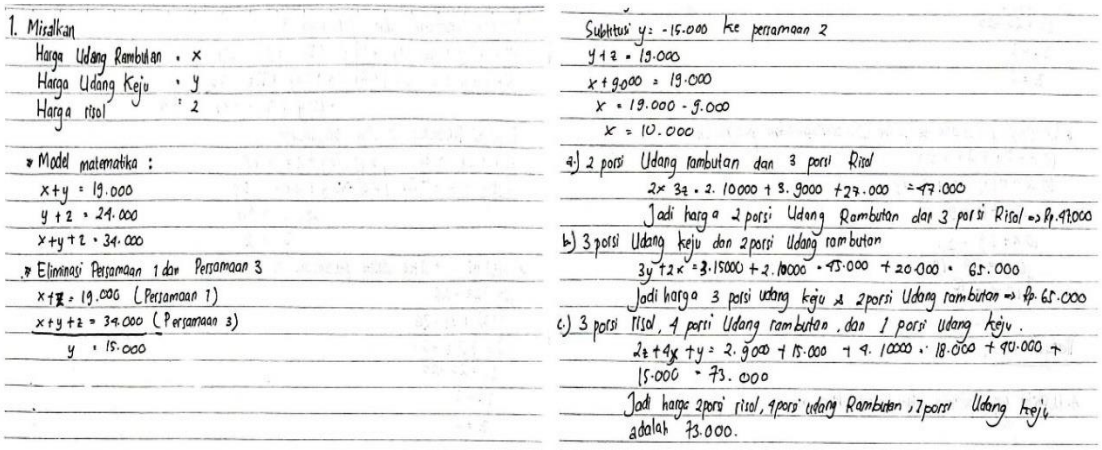


Figure 6. Student 4 of moderate initial ability

Based on the picture above, it can be seen that the two students with moderate initial abilities could not meet all the indicators of critical thinking skills for the two HOTS-oriented numeracy questions on Systems of Linear Equations with Three Variables. The results of the analysis based on critical thinking ability indicators showed that student 3 was able to provide simple explanations (elementary clarification), build essential skills (basic import), develop strategies and tactics (strategy and tactics), and conclude (inference). However, student 3 has not been able to provide further explanation (advance clarification). Student 3's interview results show, " The conclusion's explanation is the same as the conclusion ."Likewise, with student 4, the analysis results based on critical thinking ability indicators showed that student 4 could build basic skills (basic import) and develop strategies and tactics (strategy and tactics). However, student 4 could not provide a simple explanation (elementary clarification), conclusion, and further explanation (advanced clarification). The results of student 4's interview showed that "I have not written down the conclusion because I ran out of time, but I can make a conclusion from the results of my work" "I haven't concluded because I have difficulty concluding," and "I also can't explain the conclusion."

Question no. 2

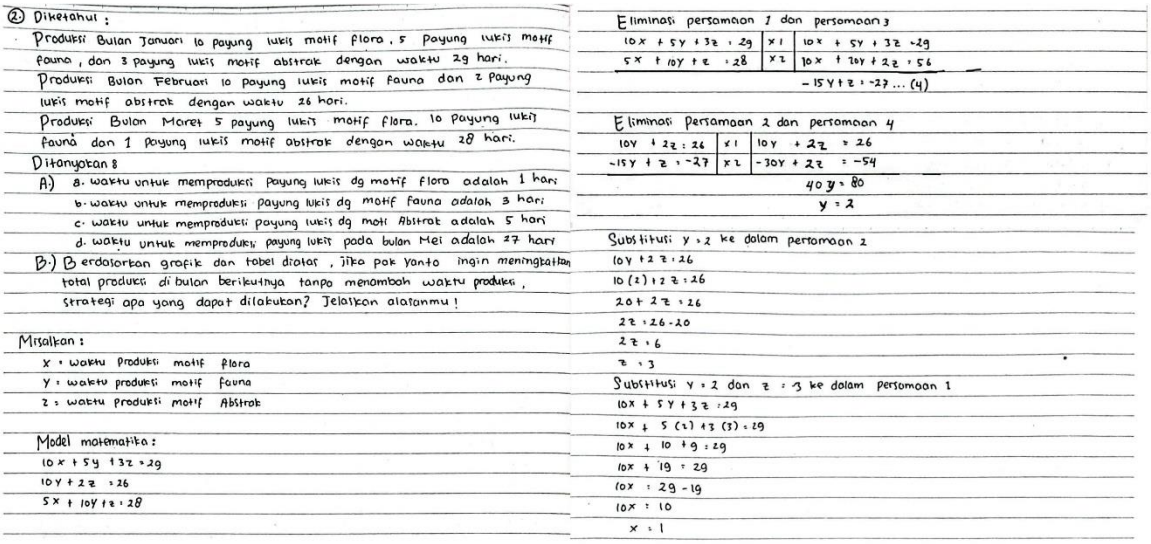


Figure 7. Student 3 has a moderate initial ability

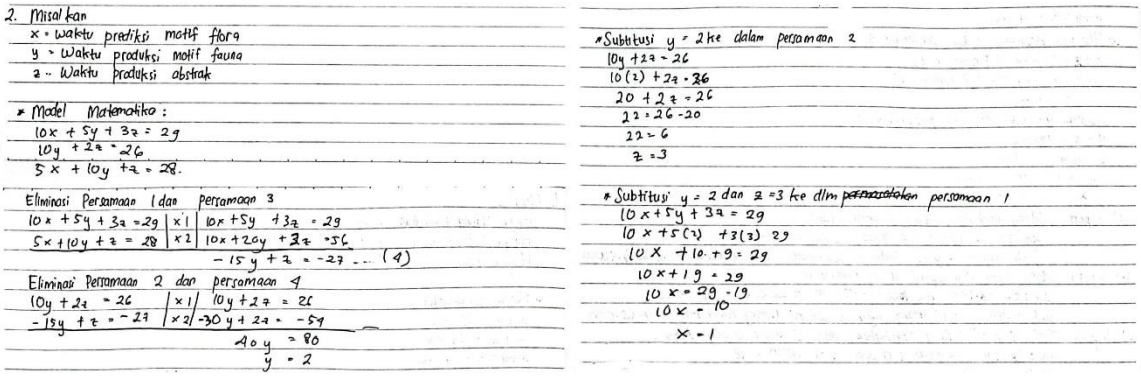


Figure 8. Student 4 has a moderate initial ability

Based on the picture above, it can be seen that the two students with moderate initial abilities failed to fulfill all critical thinking indicators for two HOTS-oriented mathematics questions regarding systems of linear equations with three variables. The results of the analysis based on critical thinking ability indicators show that Student 3 can provide simple explanations (basic clarification), build core abilities (core fundamentals), and develop strategies and tactics. However, Student 3 was still unable to formulate conclusions and provide additional explanations. In the interview, Student 3 said, “I haven't written the conclusion, but I can explain it” and “The explanation of the conclusion is the same as the conclusion itself.” Likewise with Student 4, the results of analysis based on indicators of critical thinking skills show that Student 4 is also able to build basic abilities and develop strategies and tactics. However, Student 4 was unable to provide a simple explanation, draw conclusions, or provide additional explanations. In the interview, Student 4 revealed, "I didn't write a conclusion because of limited time, but I was able to draw conclusions from

my work." He also added, "I had difficulty in drawing conclusions and couldn't explain them".

3. Critical thinking abilities of students with low initial abilities

Question no. 1

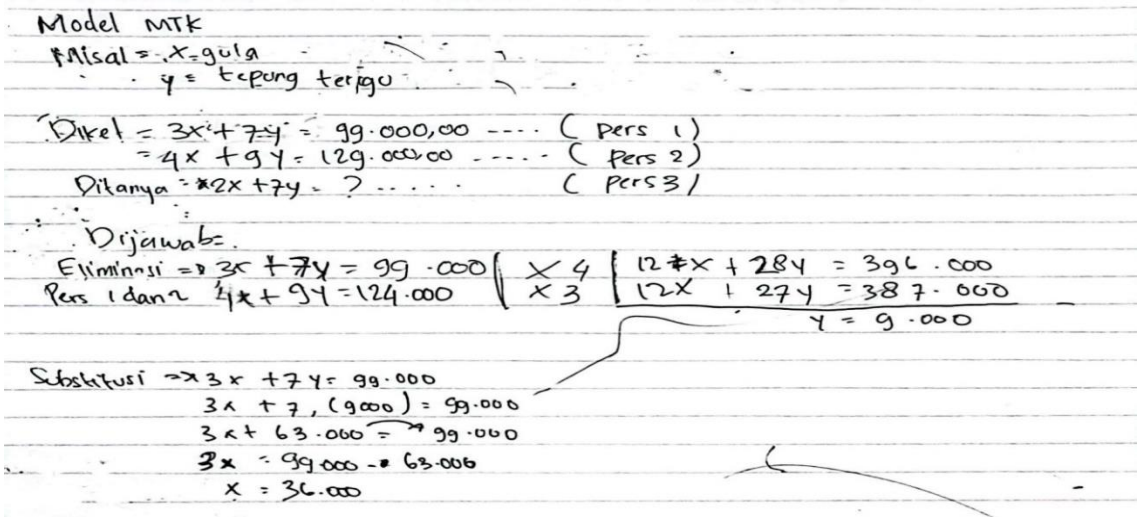


Figure 9. Student 5 of low initial ability

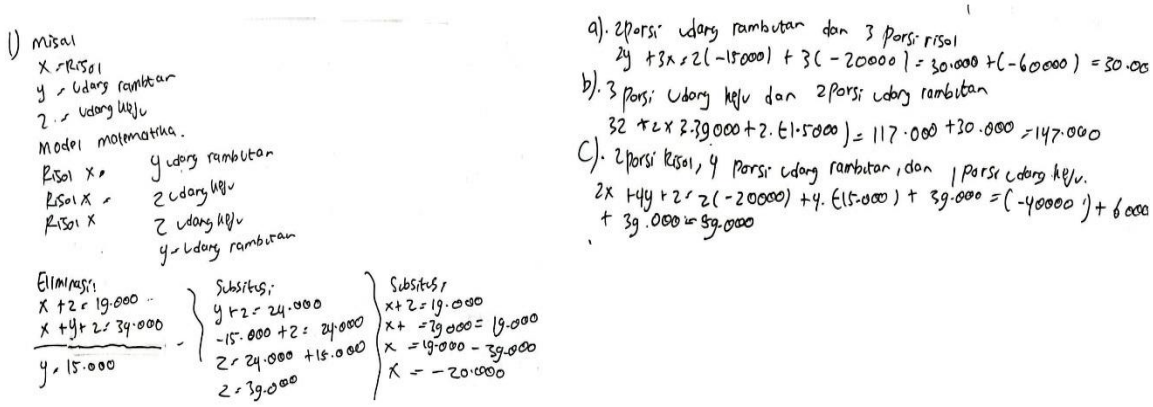


Figure 10. Student 6 of low initial ability

Based on the picture above, it can be seen that the two students with low initial abilities have not been able to fulfill all indicators of critical thinking skills for the two HOTS-oriented numeracy questions on the Three Variable Linear Equation Systems. The analysis results based on critical thinking ability indicators showed that student 5 could build fundamental skills (basic import) and develop strategies and tactics (strategy and tactics). However, student 5 has not been able to provide a simple explanation (elementary clarification), conclusion (inference), or further explanation (advanced clarification).

The results of student 5's interview showed that "I haven't written down what is known and asked"; "I haven't made a conclusion because I forgot how to eliminate one of

the variables, so I haven't reached the result yet", and "Because I haven't concluded, so I can't explain the conclusion." Likewise, with student 6, the results of the analysis based on critical thinking ability indicators showed that student 6 was able to build fundamental skills (basic import), develop strategies and tactics (strategy and tactics), and conclude (inference). However, student 6 has been unable to provide a simple explanation (elementary clarification) or give more explanation (advanced clarification). Student 6's interview results showed that "I haven't written down what is known and what is asked in the question because I don't know" and "explanation of the conclusion of the answer, namely, this is the conclusion".

Question no. 2

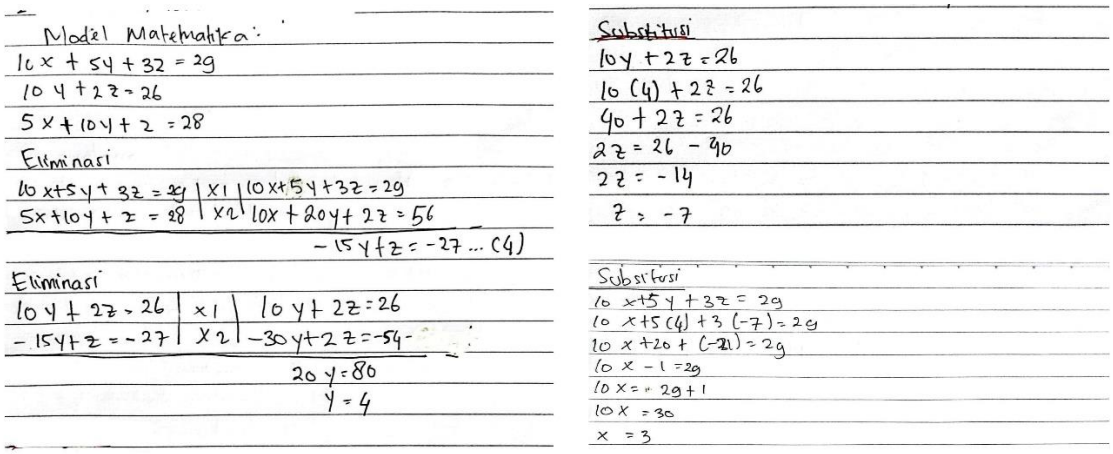


Figure 11. Student 5 of low initial ability

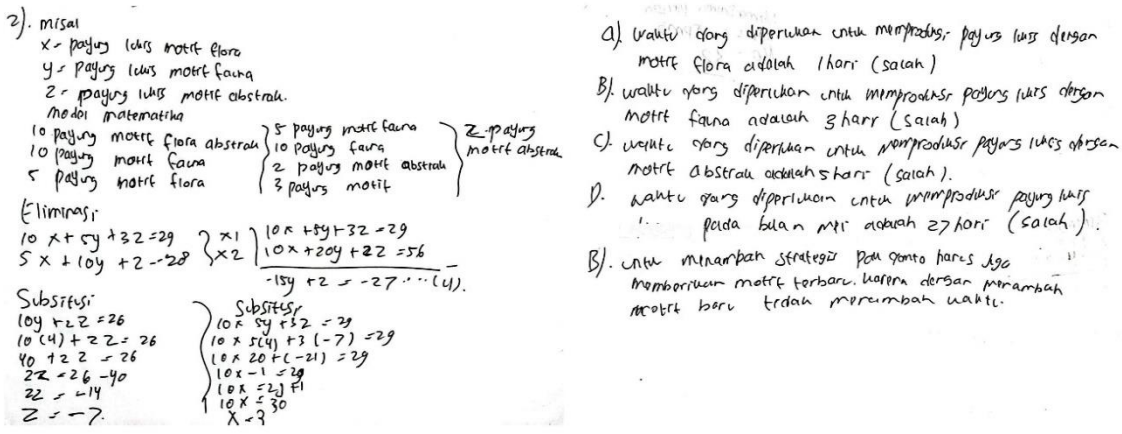


Figure 12. Student 6 of low initial ability

Based on the picture above, it can be seen that the two students with limited initial abilities could not fulfill all indicators of critical thinking skills related to two mathematics questions oriented to Higher Order Thinking Skills (HOTS) regarding systems of three-variable linear equations. The analysis shows that students can build five basic skills (basic import) and develop strategies and tactics (strategies and tactics) in the learning process.

However, Student 5 was unable to provide a simple explanation (elementary clarification), conclude (inference), or give a more in-depth explanation (advanced clarification).

The results of the interview with student 5 showed that "it's the same as number 1 above that I can't write down what is known and what is asked", "I haven't made a conclusion either because I forgot how to eliminate one of the variables, so I haven't been able to find the results", and "Because I haven't concluded, I haven't been able to explain the conclusion". Likewise with student 6, the results of the analysis based on the critical thinking ability indicator showed that student 6 was able to build basic skills (basic import), develop strategies and tactics (strategy and tactical), and conclude (inference). However, student 6 was not yet able to provide a simple explanation (elementary clarity) or provide further explanation (advanced clarity). The results of the interview with student 6 showed that "I haven't written down what is known and what is asked in the question because I don't know yet" and "explanation of the conclusion of the answer, namely this is the conclusion, as far as I know".

More detailed research results can be presented in table form below.

Table 1. Students' critical thinking ability analysis

Essential indicator of thinking abilities	Students' initial abilities					
	High		Moderate		Low	
	Student 1	Student 2	Student 3	Student 4	Student 5	Student 6
Problem number 1						
Elementary Clarification	√	√	√	-	-	-
Basic Import	√	√	√	√	√	√
Strategy and Tactics	√	√	√	√	√	√
Inference	√	√	√	√	-	√
Advance Clarification	√	√	-	-	-	-
Problem number 2						
Elementary Clarification	√	√	√	-	-	-
Basic Import	√	√	√	√	√	√
Strategy and Tactics	√	√	√	√	√	√
Inference	√	√	√	√	-	√
Advance Clarification	√	√	-	-	-	-

Based on the explanation of the analysis of students critical thinking abilities in solving HOTS-oriented numeracy problems on Three Variable Linear Equation Systems material, which was carried out by six students with high, moderate, and low initial skills based on the student's critical thinking indicators proposed by Ennis (1985), the results showed that students essential abilities of thinking were still relatively low because some students had not been able to meet all the indicators of critical thinking abilities. In other words, students cannot think critically to optimally solve HOTS-oriented numeracy

problems on Systems of Linear Equations with Three Variables. This research aligns with research conducted by Faiziyah & Priyambodho (2022). Apart from that, this research is related to research conducted by Faiziyah & Putra (2024), which states that students with high initial abilities can fulfill all critical thinking indicators. The results of this research show that the two students with high initial abilities could fulfill all indicators of critical thinking ability; in other words. Students with high initial abilities can identify and formulate problems, they can document the information they already know and the questions they want to ask, in addition, they are also able to apply the right strategies and tactics when making calculations, these students understand the problem well so they can conclude from the results and answers obtained, and can explain the reasons behind these conclusions. In other words, students with high initial abilities can think critically in solving HOTS-oriented numeracy problems in the Three-Variable Linear Equation System.

Students who have higher initial abilities tend to be better able to meet critical thinking indicators, because students with high initial abilities already have a stronger knowledge base. This allows them to more quickly understand and explain information. In addition, students with high initial abilities are also better trained in identifying important concepts and have better analytical skills in developing arguments and evidence. This supports the use of more effective inference strategies and tactics. With deeper understanding, high initial ability students are able to provide more logical and structured explanations, thanks to their ability to learn multiple concepts, integrate multiple perspectives, and articulate thoughts more clearly. All this suggests that higher initial abilities not only provide a cognitive advantage, but also enhance the application of critical thinking in a more complex and holistic manner.

Meanwhile, students with moderate and low initial abilities have not been able to meet all indicators of critical thinking abilities. This aligns with research conducted by Sriyanti et al. (2024). According to Risky et al. (2024), students with moderate initial abilities also have poor critical thinking abilities.

CONCLUSION

The results of the study indicate a relationship between student ability and the level of critical thinking indicators. Students with high initial ability tend to be able to meet all critical thinking indicators, while students with medium and low initial ability experience various obstacles in several aspects. In particular, the indicator for advanced clarification seems to be the biggest challenge for students with medium and low initial ability, indicating

that more complex critical thinking skills require deeper understanding. On the other hand, indicators of basic understanding, strategies and tactics are more accessible even to students with low initial ability. These results also indicate that more adaptive and personalized learning strategies are needed to support students with low initial ability in developing their critical thinking skills. Through more targeted guidance, students can develop their critical thinking skills optimally, minimizing differences in their abilities.

In this study it was found that there were two students with high ability, two students with medium ability, and two students with low ability. These findings indicate differences in the level of understanding and academic achievement among students, which can influence the effectiveness of the learning process. Therefore, it is important to consider implementing more adaptive learning strategies, such as differentiating instruction or providing additional guidance for students with lower abilities. Thus, the results of this research can be a basis for developing more inclusive and effective teaching methods that can meet the learning needs of each student.

REFERENCES

Aditama, F. K., Putri, C. N., & Kohar, A. W. (2023). Profil Berpikir Kritis Siswa SMA dalam Menyelesaikan Soal Numerasi. *Jurnal Kajian Pendidikan Matematika*, *2682*(2), 319–332.

Akhyar, I. W., & Senjayawati, E. (2023). Analisis Kemampuan Pemecahan Masalah Matematis SMK Pada Materi SPLTV Ditinjau Berdasarkan Gender. *Jurnal Pembelajaran Matematika Inovatif*, *6*(4), 1483–1492. https://doi.org/10.22460/jpmi.v6i4.18068

Azvani Chaniago, Z., & Ajiz Awalludin, S. (2024). Analisis Kemampuan Berpikir Kritis Matematis Ditinjau dari Tipe Kepribadian dalam Menyelesaikan Soal Literasi dan Numerasi. *SJME (Supremum Journal of Mathematics Education*, *08*(02), 215–233. https://doi.org/10.35706/sjme.v8i2.11306

Dewi, A., & Machromah, I. U. (2022). Kemampuan Berpikir Kreatif Siswa dalam Menyelesaikan Soal HOTS Ditinjau dari Kemampuan Awal Matematika. *Jurnal Math Educator Nusantara: Wahana Publikasi Karya Tulis Ilmiah Di Bidang Pendidikan Matematika*, *8*(2), 168–188. https://doi.org/10.29407/jmen.v8i2.17779

Diana, H. A., & Saputri, D. V. (2022). Model Project Based Learning Terintegrasi STEAM Terhadap Kecerdasan Emosional dan Kemampuan Berpikir Kritis. *Jurnal Numeracy*, *8*(2), 113–127.

Duri, T., Lubis, R., Ahmad, M., Mipa, F., Tapanuli, P., & Abstrak, S. (2021). Analisis Kemampuan Berpikir Kritis Matematika Siswa Pada Masa Pandemi Covid-19. In *Mathematic Education Journal)MathEdu* (Vol. 4, Issue 3). http://journal.ipts.ac.id/index.php/

Ennis, R. H. (1985). A Logical Basis For Measuring Critical Thinking Skills. In *Education Leadership* (Vol. 11, Issue 1, pp. 44–48). https://pdfs.semanticscholar.org/80a7/c7d4a98987590751df4b1bd9adf747fd7aaa.pdf

Faiziyah, N., & Legawo Priyambodho, B. (2022). Analisis Kemampuan Berpikir Kritis

Dalam Menyelesaikan Soal HOTS Ditinjau Dari Metakognisi Siswa. *Jurnal Program Studi Pendidikan Matematika*, *11*(4), 2823–2835.

Faiziyah, N., & Putra, A. D. (2024). Analisis Kemampuan Berpikir Kritis Siswa dalam Menyelesaikan Masalah Sistem Persamaan Linear Tiga Variabel Ditinjau dari Kemampuan Awal. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *08*(01), 725–735.

Hidayat, W., & Sari, V. T. A. (2019). Kemampuan Berpikir Kritis Matematis dan Adversity Quotient Siswa SMP. *Jurnal Elemen*, *5*(2), 242–252. https://doi.org/10.29408/jel.v5i2.1454

Mulyawan, M. I., Setiani, Y., & Hadi FS, C. A. (2023). Efektivitas Pendekatan Open-Ended pada Pembelajaran Matematika untuk Meningkatkan Kemampuan Berpikir HOTS Matematis Siswa SMP. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *7*(1), 421–431. https://doi.org/10.31004/cendekia.v7i1.1911

Purnamasari, I., & Setiawan, W. (2019). Kemampuan Pemecahan Masalah Matematis Siswa SMP pada Materi SPLDV Ditinjau dari Kemampuan Awal Matematika (KAM). *Journal of Medives : Journal of Mathematics Education IKIP Veteran Semarang*, *3*(2), 207–215.

Rahimah, N. (2019). Profil Berpikir Kritis Siswa Dalam Memecahkan Masalah Matematika Berdasarkan Kemampuan Matematika. *LENTERA Jurnal Ilmiah Kependidikan*, *14*(1), 59–68.

Risky, M. N. A., Hamdani, Hartoyo, A., Bistari, & Siregar, N. (2024). Pengaruh kemampuan awal terhadap kemampuan berpikir kritis siswa mts dalam pembelajaran matematika. *Jurnal Pembelajaran Matematika Inovatif*, *7*(1), 205–216. https://doi.org/10.22460/jpmi.v7i1.20189

Rogers, M. (2019). Numeracy as critical thinking. *ALM International Journal*, *14*(1), 23–33.

Sanvi, A. H. (2022). Analisis Kemampuan Numerasi Pada Materi Matriks. *Jurnal Pendidikan Matematika*, *3*(2), 129–145.

Setiana, N. P., Fitriani, N., & Amelia, R. (2021). Analisis Kemampuan Pemecahan Masalah Matematis Siswa SMA Pada Materi Trigonometri Berdasarkan Kemampuan Awal Matematis Siswa. *Jurnal Pembelajaran Matematika Inovatif*, *4*(4), 899–910. https://doi.org/10.22460/jpmi.v4i4.899-910

Sintya, G., & Sari, C. K. (2024). Kemampuan Berpikir Kritis Siswa dalam Memecahkan Soal Numerasi Ditinjau dari Self Confidence. *Jurnal Inovasi Pendidikan Matematika*, *7*(1), 292–306.

Sriyanti, A., Samdewi, A. R., Mania, S., & Yuliany, N. (2022). Analisis Soal Tipe Higher Order Thinking Skill (HOTS) pada Buku Ajar Matematika SMK Kelas XI. *EDUKATIF: Jurnal Ilmu Pendidikan*, *4*(2), 2385–2394. https://doi.org/10.31004/edukatif.v4i2.2400

Sriyanti, A., Saputri, A., Rahman, U., & Munirah. (2024). Analisis Kemampuan Berpikir Kritis Matematis Ditinjau dari Tipe Kepribadian Introvert Peserta Didik. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *08*(03), 2319–2331.

Widya, L. N., Sa'dijah, C., & Chandra, T. D. (2023). Kemampuan Berpikir Kritis Siswa SMP dalam Menyelesaikan Asesmen Kompetensi Minimum Numerasi Ditinjau dari Efikasi Diri. *Jurnal Paedagogy: Jurnal Penelitian Dan Pengembangan Pendidikan*, *10*(4), 1189–1199.

Zakiyah, S., Wahyu, H., & Wahyu, S. (2019). Analisis Kemampuan Pemecahan Masalah dan Respon Peralihan Matematik dari SMP ke SMA pada Materi SPLTV. *Mosharafa: Jurnal Pendidikan Matematika*, *8*(2), 227–238. http://journal.institutpendidikan.ac.id/index.php/mosharafa