# *Analysis of Students' Mathematical Literacy Ability in Solving Higher Order Thinking Skills (HOTS) Problem*

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***Abstract***

The purpose of this study was to describe students' mathematical literacy skills in solving HOTS-based problems on the system of linear equations of two variables in class VIII at SMP Negeri 1 Padangsidimpuan. The approach used is qualitative with the type of description research. The data sources of this research came from test results and interviews. Data collection was done with written tests and interviews. Triangulation of data analysis includes reduction, presentation, and conclusion drawing. The results of this study are the students' mathematical literacy skills in solving HOTS problems on the system of linear equations of two variables which show that out of 28 students there are 6 students with high mathematical literacy skills who are less able to provide logical arguments to problems, 15 students with moderate mathematical literacy skills have not met the indicators of using mathematical tools and providing arguments or reasoning and 7 students with low mathematical literacy skills have not met the indicators of communicating problems, mathematization, using mathematical symbols, using mathematical tools, and providing arguments or reasoning.

***Keywords:*** *Mathematical Literacy; Linear Equation System Two Variables; Higher Order Thinking Skills (HOTS).*

**Abstrak**

Penelitian ini bertujuan untuk mendeskripsikan kemampuan literasi matematis siswa dalam menyelesaikan soal berbasis HOTS materi sistem persamaan linear dua variabel kelas VIII di SMP Negeri 1 Padangsidimpuan. Pendekatan yang digunakan ialah kualitatif dengan jenis penelitian deskripsi. Sumber data penelitian ini berasal dari hasil tes dan wawancara. Pengumpulan data dilakukan dengan tes tertulis dan wawancara. Triangulasi analisis data meliputi reduksi, penyajian, dan penarikan kesimpulan. Hasil dari penelitian ini adalah kemampuan literasi matematis siswa dalam menyelesaikan soal HOTS materi sistem persamaan linear dua variabel yang menunjukkan bahwa dari 28 siswa terdapat 6 siswa dengan kemampuan literasi matematis tinggi yang kurang mampu dalam memberikan argumen logis terhadap permasalahan, 15 siswa dengan kemampuan literasi matematis sedang belum memenuhi indikator menggunakan alat matematika dan pemberian argumen atau penalaran serta 7 siswa dengan kemampuan literasi matematis rendah belum memenuhi indikator mengkomunikasikan masalah, matematisasi, menggunakan simbol matematika, menggunakan alat bantu matematika, dan pemberian argumen atau penalaran.

**Kata Kunci:** Literasi Matematis; Sistem Persamaan Linear Dua Variabel; Higher Order Thinking Skills (HOTS).

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## INTRODUCTION

Education is one of the important factors where a country's authority is obtained, with good education it will give birth to a generation that is intelligent and competent in their fields, so that the condition of the nation will experience an improvement in the presence of qualified generations of the nation. One of the education policies in Indonesia is to improve the quality of education (Baro'ah, 2020). So that with education humans can learn and develop into a more qualified person who can improve their dignity. Education has a very important role for every human development.

The quality of a nation's human resources is determined by the nation's level of education. Educators play an important role because education is a vehicle to improve and develop the quality of human resources. In the world of education, especially school education, mathematics is one of the most important subjects because mathematics is a science that can train to think critically, systematically, logically, and creatively (Hoiriyah, 2019). Mathematics also has a strong and clear structure and relationship between its concepts, thus enabling students to be skilled in rational thinking. Given this, it is important to study mathematics not only to know but also to try to understand and be able to apply it in other problems (Maharani, 2019).

Mathematical literacy according to the OECD is the ability to formulate, apply and interpret mathematics in various contexts, including the ability to reason mathematically and use concepts, procedures, and facts to describe, explain or predict phenomena/occurrences (Setiasih, Asikin, & Mariani, 2019).

The importance of mathematical literacy has not been matched by the quality of education in Indonesia, it can be seen from various types of international level assessments that Indonesia participates in, one of which is still ongoing until now is the Program for International Student Assessment (PISA) which measures the literacy skills of reading, mathematics and science of students aged 15 years or equivalent to junior high school education level and Indonesia ranks third from the back. The PISA results show that the mathematical literacy skills of Indonesian students are not optimal. Whereas mathematical literacy is in

accordance with the literacy and content standards of the subject because in essence the ability to be achieved in the content standards of mathematics learning objectives is mathematical literacy (Muti'ah & Irmayanti, 2020) Indonesia's participation in the PISA study aims to obtain information about the ability of Indonesian students in mathematical literacy.

PISA is conducted every three years by the OECD to measure reading, math and science literacy. In 2022, the assessment was conducted on about 690 thousand students. Indonesia ranked 70 out of 81 countries with a score of 366, the highest score achieved by Singapore with a score of 575 and the lowest score achieved by China with a score of 352. Compared to previous years, Indonesia's math literacy rose 5 positions. However, the ranking is still said to be low (Agustiani, 2020).

Indonesia's low ranking in the PISA study can be caused by many factors. Some of the contributing factors include Indonesia not implementing an education system that is equivalent to the countries participating in the PISA survey, then Indonesian students are generally less trained in solving problems with characteristics such as in PISA questions, a curriculum that does not comprehensively cover mathematical literacy, sloppy development of mathematical literacy, mathematics education that does not cover mathematical literacy, and low mathematical literacy skills (Amaliya & Fathurohman, 2022). Therefore, Indonesia's development in each PISA period has not shown significant results (Febrianti, Rahmat, Aniswita, & Fitri, 2023), to improve Indonesia's ranking in the PISA study cannot be done instantly, there are small things that need to be considered. One of them is the teacher's attention to the data on Indonesia's results in the PISA study.

In reality, we can see from the result of students' work on the following SPLDV problems. Students feel confused and don't understand in solving SPLDV problems because it is mathematics that studies algebra or abstract things because it contains things that are not concrete.

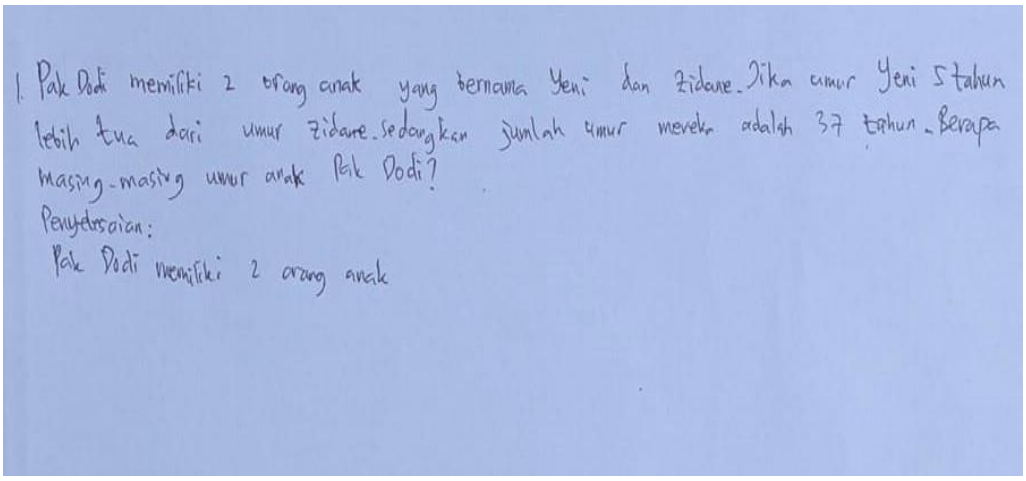


**Figure 1. Students' Prior Knowledge and Ability**

Student difficulties shown in the figure are caused by several factors, such as low cognitive ability, low mathematical ability, low ability to use symbols and arithmetic operations, low reasoning and reasoning ability, low problem solving ability, low ability to identify complex problems and organize or relate to applicable mathematical knowledge, low ability to describe, explain, and predict a phenomenon in various contexts, low ability to describe, explain, and predict a phenomenon in a mathematical context and low ability to describe, explain, and predict a phenomenon in various contexts (Jatmiko, 2018).

Mathematical literacy is the right choice to work on math problems precisely and carefully, especially on the material of the system of linear equations of two variables (Sumardi & Aslami, 2022), so as to produce the right answer to the given problem. Prior knowledge and abilities possessed by students become materials that are aligned as a basis for thinking in solving problems (Hasanuddin, 2020). Mathematics is a science related to abstract concepts, therefore the presentation of mathematical material in learning is often related to everyday life.

Mathematical literacy is defined as the competence to use mathematical knowledge and understanding effectively to face the challenges of everyday life (Mahsarah Rahadatul Aisy-Stevanus Budi Waluya-Zaenuri, Mahsarah Rahadatul Aisy, & Budi Waluya, 2021). The aspects observed in mathematical literacy to measure the three competency clusters include reasoning, argumentation,

communication, modeling, connection, problem-solving, and representation (Reflina & Rahma P, 2023)

HOTS is a higher cognitive level thinking process developed from various concepts and methods. HOTS includes problem-solving skills, critical thinking skills, logical, creative, and argumentative skills. HOTS questions are questions that measure the ability to: (1) transfer one concept to another; (2) process and apply information; (3) find links from different information; (4) use information to solve problems; and (5) critically examine ideas and information (Desiriah & Setyarsih, 2021).

Formally, the definition of mathematical literacy in the PISA framework is presented by the OECD, there are three main domains that are the main ideas of the concept of mathematical literacy, namely: (Harpeni, 2019).

1. The ability to create, use, and interpret mathematics in various contexts is known as the mathematical process (Context).
2. The use of mathematical reasoning and mathematical concepts, facts, procedures and tools to describe, explain and predict phenomena (Process).
3. Being able to understand mathematics can help one apply it in everyday life as a way to participate in a constructive and reflective society (Content).

In conclusion, there are seven indicators in students' mathematical literacy skills, namely (1) mathematical communication, (2) representation, (3) reasoning and argument, (4) formulating problem solving strategies, (5) using forms and symbols, (6) operational strategic techniques and language, and (7) using mathematical tools.

Higher Order Thinking Skill (HOTS) is the ability to think critically, logically, reflectively, metacognitively, and think creatively which is a high-level thinking ability (Sari & Aulia E, 2022). HOTS or higher order thinking skills is a thinking ability that does not only require the ability to remember, but requires other higher abilities as well as creative and critical thinking skills.

Mathematical literacy can help in solving HOTS (Higher Order Thinking Skills) problems by increasing students' basic mathematical literacy skills, such as communication, mathematization, representation, reasoning and reasoning, and

solving mathematical problems (Murtadlo, Muslimahayati, Sahanata, & Ramli, 2023). Students who have better mathematical literacy skills can use these skills to understand and solve more complex mathematical problems related to HOTS. Therefore, based on the problems shown in the figure and the interview results, it can be concluded that students' understanding of mathematical literacy is still low.

## RESEARCH METHODS

This type of research uses a qualitative descriptive approach. This research was conducted at SMP Negeri 1 Padangsidimpuan. The subjects of this study were 6 students of SMP Negeri 1 Padangsidimpuan in class VIII-1. Students of class VIII-1 at SMP Negeri 1 Padangsidimpuan, who answered or responded to the written test, were the main source of data for this study. The study involved 6 students, including 2 upper ability students, 2 middle ability students, and 2 lower ability students. Determination of research subjects is based on class mean and standard deviation. Class standard deviation is to determine the deviation of data.

**Table 1. Classification of Ability Level**

| Value Limit | Description |
|---|---|
| $X \geq (x + SD)$ | High |
| $x - SD) < (x + SD)$ | Medium |
| $X \leq (x - SD)$ | Low |

The research will be analyzed based on 3 different categories, in taking subjects randomly (random). The high category is with research subjects YS and SC, the medium category with research subjects UH and RK, the low category with research subjects PH and SP. The data collection technique is a test in the form of a description of 5 questions and interviews. The data processing and analysis techniques of this research are data reduction, data presentation and conclusion drawing.

## RESULTS AND DISCUSSION

The research data can be seen from the score of students' mathematical literacy skills in answering questions about linear equations of two variables. The following presents the results of the analysis of student work.

a. High ability students

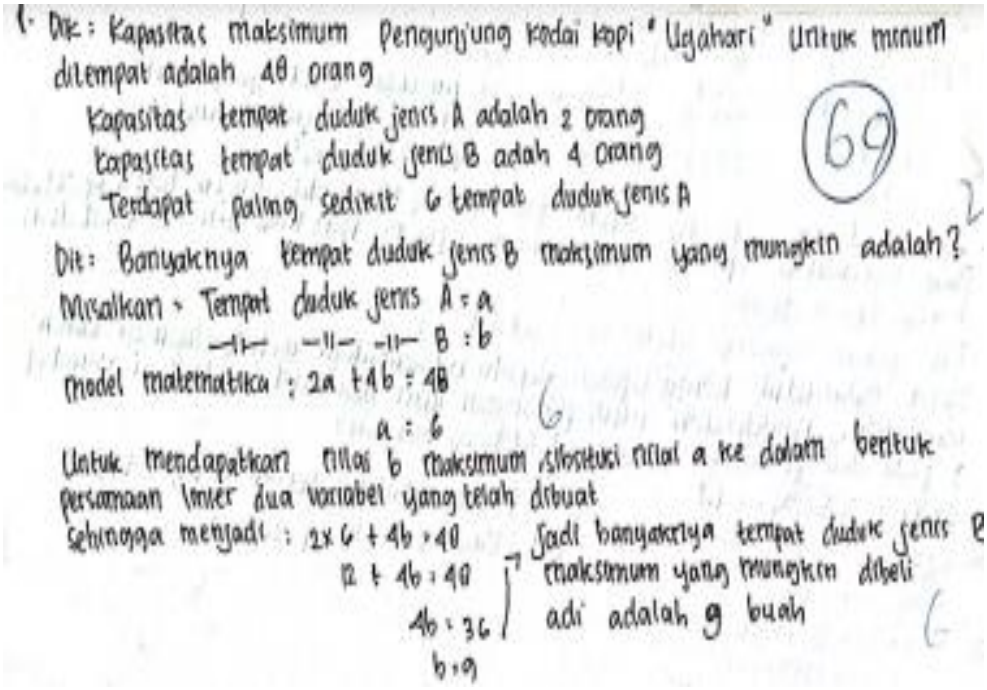


**Figure 2. The Result of The Work of Research Subject I**

Based on Figure 2 is an answer sheet from one of the students with high mathematical literacy skills. Based on the test results, it can be seen that problem number 1 can be solved by the research subject. In terms of communicating problems, it can be seen from what is known and asked, This is in line with research conducted by Rima and Nining (Santoso & Setyaningsih, 2020) which states that research subjects with high ability have good communication skills. good. It can be seen that the subject can recognize and explain what is known and asked, converting problems to mathematical form, restating mathematical problems by making equations, namely $2a + 4b = 48$ and $a = 6$, can make logical arguments in solving problems, namely the maximum number of type B seats that Adi might buy is 9 chairs, developing

strategies to solve problems: Can choose a strategy by using the substitution method, able to use mathematical symbols, for example changing verbal language into mathematical language, seating with type A is denoted by a and seating with type B is denoted by b, able to answer problems with correct calculations, for example 36 divided by 4 equals 9.

b. Medium ability students

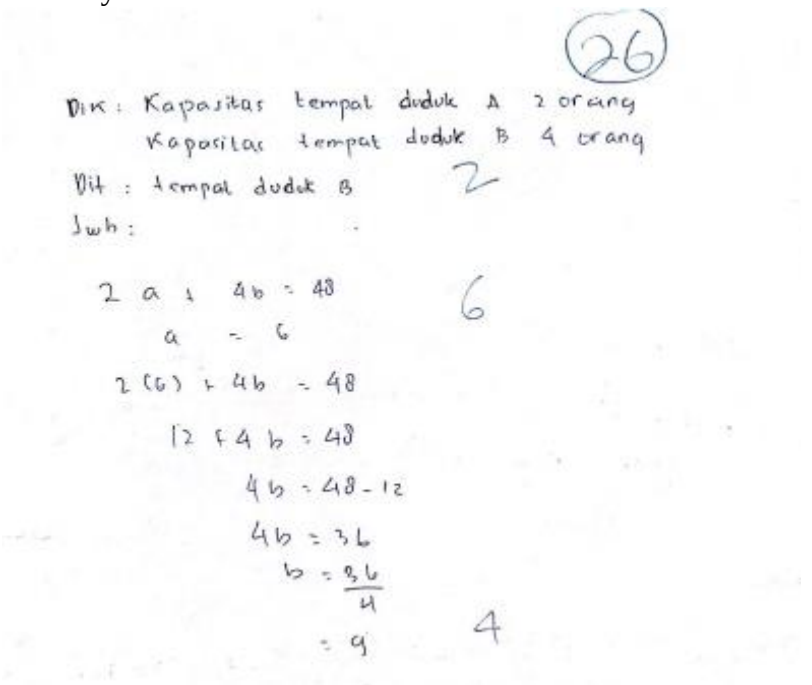


**Figure 3. The Result of The Work of Research Subject II**

Based on Figure 3 is a student answer sheet used to find out more information about students' mathematical literacy skills. Research subject IV is incomplete in writing what is known and asked, the research subject is less able to convert problems to mathematical form, rewrite what is known into equations, $2a + 4b = 48$, $a = 6$, the research subject has not written arguments or conclusions from the problems given in the problem, this is proven by previous research that students with moderate ability have not fulfilled the indicators of reasoning and giving appropriate reasons, using the first step of elimination and the second step of substitution, normalizing type A seating as a and type B seating as b, using calculation operations such as 36 divided by 4 equals 9.

c. Low ability students

Subjects who have low mathematical ability, the results of the analysis are presented in Figure 4.

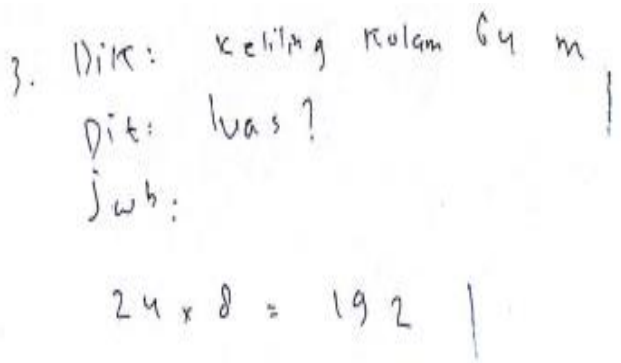


**Figure 4. The Result of The Work of Research Subject III**

Based on Figure 4 is a student answer sheet used to find out more information about students' mathematical literacy skills. The research subject is incomplete in writing what is known and asked, the research subject has not changed the problem to mathematical form. In the previous study, it was stated that students with low mathematical literacy skills were not able to use mathematical tools or arithmetic operations due to the lack of understanding of the concepts of the students (Neky, Hamdani, & Bistari, 2024), the research subject also has not rewritten the equations in the problem, the research subject does not provide conclusions from the problems given, the research subject also has not written the process of getting answers according to strategies that can be used in the system of linear equations of two variables, has not converted verbal language into symbolic language, is able to use arithmetic operations as shown by the answer 24 times 8 equals 192.

## CONCLUSION

Based on the results of the analysis and discussion in terms of 7 indicators of mathematical literacy, namely communication, mathematizing, representation, reasoning and argument, devishing strategies for solving problems, using symbolic, formal, and technical language and operation, and using

mathematics tools, Then the conclusion is obtained that the students of SMP Negeri 1 Padangsidimpuan class VIII in solving the problem of two-variable linear equation system in terms of mathematical literacy ability, then the research results show that out of 28 students there are 6 students with high mathematical literacy ability who are able to fulfill the indicators of mathematical literacy, however, they are still less able to provide logical arguments to problems, 15 students with moderate mathematical literacy skills have not met the indicators of using mathematical tools and providing arguments or reasoning and 7 students with low mathematical literacy skills have not met the indicators of communicating problems, mathematization, using mathematical symbols, using mathematical tools, and providing arguments or reasoning.

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