



ORIGINAL PAPER

Numeracy Literacy Ability of High School Students in Solving Statistics Questions

Megaria Refwalu⁽¹⁾, Juliana Ersje Pritulu⁽²⁾, Anderson Palinussa⁽³⁾

^{1,2}Pre-Service Teacher Professional Education, Pattimura University, Ambon, Indonesia

³Mathematics Education, Faculty of Teacher Training and Education, Pattimura University, Ambon, Indonesia

Accepted: June 11, 2025

Abstract

Numeracy literacy skills refer to an individual's ability to understand, interpret, and apply mathematical concepts, numbers, and data in everyday life to make appropriate decisions and solve practical problems. This study aims to describe the numeracy literacy abilities of class XII students of senior high schools in Ambon City in solving statistical problems using a qualitative descriptive research design. The data sources include the mathematics teacher and the students. The subjects, selected based on test results, consisted of 22 students. Data were collected through written tests containing three questions related to statistical material and interview results. The data were analysed through data reduction, data presentation, and conclusion drawing stages. The results show that high-performing students were able to meet all numeracy literacy skill indicators; students with moderate ability were unable to use various mathematical numbers or symbols to solve real-life problems and were unable to analyse information in various forms (graphs, tables, charts, diagrams, etc.). In contrast, low-performing students fail to meet all numeracy and literacy skill indicators. Therefore, the numeracy literacy ability of the high school students was categorised as low, at 22.58%.

Keywords:

Numeracy
Literacy Skills
Statistics

Corresponding Author:

Name: Juliana Ersje Pritulu

Email: pritulujuli@gmail.com

INTRODUCTION

The 21st century is an era of rapidly developing digitalisation, encouraging technology to be widely used in various fields, including education. The existence of increasingly accessible sources of information and communication makes the learning process more effective. Murnane (2012) stated that having numeracy literacy skills is one of the prerequisites for students to succeed in the 21st century. Numeracy literacy skills are potential within a person who is systematically developed to understand and apply the concept of numbers and arithmetic operations and make the right decisions based on mathematical data in the form of numbers, symbols, or other information that is relevant to everyday life (Arahmah et al., 2021). Numeracy literacy skills can also be understood as critical thinking skills in understanding, interpreting, and applying mathematical concepts or numbers to solve everyday problems using symbols, language, or mathematical models conveyed through oral or written communication (Ekowati et al., 2019). Thus, numeracy literacy skills are a person's capacity to understand, interpret, and apply mathematical concepts, numbers, and data in everyday life to make the right decisions and solve practical problems. Numeracy literacy skills are very important to be developed regularly and sustainably because this ability provides benefits in the learning process, work, and interactions throughout life (Silitonga et al., 2023). Thus, in the 21st century, numeracy literacy skills

play an important role. Having an understanding of numbers, symbols, and data will help students make the right decisions, solve everyday problems, and adapt to the challenges of the modern world.

The results of the 2022 PISA, which were announced on December 5, 2023, showed that Indonesia was ranked 68th out of 81 countries, with scores in mathematics (379), science (398), and reading (371). The PISA results show that the numeracy literacy skills of students in Indonesia are still low. This is in line with the results of research conducted by Jazilah et al. (2023), which states that students' numeracy literacy skills are still very low. This is indicated by the percentage of numeracy literacy skills based on the categorisation of the high group of 28.1%, the medium group of 34.4%, and the low group of 37.5%. The low numeracy literacy skills of Indonesian students can be observed based on facts in the field when participating in PPL I of Teacher Professional Education. Students have mostly mastered the basic concepts of mathematical arithmetic. However, the application of these concepts in solving non-routine problems is often overlooked. Students tend to focus on getting the final result without reading and listening to the information obtained in the questions. These facts in the field are in line with the opinion (Ambarwati & Kurniasih, 2021) that in mathematics learning in Indonesia, students have not been able to connect material with real-world situations, which causes students to have difficulty in translating texts or narratives into mathematical models and in processing the information obtained into accurate mathematical representations.

Numeracy literacy skills learned through mathematics are subjects that contribute to everyday life practices (Wulandari, 2021). Statistics is one of the mathematical subject areas. Statistics is a field that focuses on methods of collecting, processing, and analysing data to assist in making the right decisions (Yuliani et al., 2017). The ability to present data, tables, and graphs is an important part of numeracy literacy that allows someone to communicate information clearly and effectively (OECD, 2023). Researchers chose statistical material to analyse students' numeracy literacy skills in everyday life because it helps data analysis and proper decision-making in various fields such as economics, health, education, and business. Therefore, this study aims to describe the numeracy literacy skills of grade XII high school students at one of the State High Schools in Ambon City in solving statistical problems.

METHOD

The type of research carried out is descriptive qualitative research. The research was carried out at Ambon City State High School, with the research subjects being 22 class XII students. Research data was collected through tests and interviews, which were used to analyse students' numeracy literacy skills in solving statistics questions. The following indicators of numeracy literacy skills (Han et al., 2017) and the scoring rubric used in this research are presented in Table 1.

Table 1. Numeracy Literacy Ability Indicators and Score Rubric

Code	Indicators of Numeracy Literacy Ability	Information	Score
N1	The ability to use various numbers or basic mathematical symbols to solve problems in everyday life.	Unable to use numbers or basic mathematical symbols in solving problems.	0
		It can use numbers or basic mathematical symbols, but there are still many errors in its application. The results do not match the context of the problem.	1
		You can use numbers or basic mathematical symbols correctly, but some minor errors or applications are not entirely appropriate to the context of the problem.	2
		Using basic mathematical numbers or symbols is correct in most situations, but there are still small errors in application that can affect the results.	3

Code	Indicators of Numeracy Literacy Ability	Information	Score
		Using numbers or basic mathematical symbols very precisely and effectively in solving daily life problems. All calculations or symbols are used according to the context of the problem.	4
N2	Ability to analyse information in various forms (graphs, tables, charts, diagrams, etc.).	Unable to analyse or understand information from graphs, tables, charts, or diagrams.	0
		It can recognise basic information from graphs, tables, charts, or diagrams, but cannot draw accurate conclusions or still makes many errors.	1
		Analyses information fairly accurately from graphs, tables, charts, or diagrams correctly, but some parts are less accurate or cannot draw in-depth conclusions.	2
		Analyses information with reasonable accuracy from graphs, tables, charts, or diagrams and can draw relevant conclusions, even if there are some minor errors.	3
		Analyse information very precisely and deeply from various forms (graphs, tables, charts, diagrams, etc.) and can draw very relevant conclusions, as well as provide accurate interpretations.	4
N3	The ability to interpret the results of problem analysis to predict possible outcomes and make appropriate decisions.	Unable to interpret analysis results or make predictions and decisions.	0
		It can provide a basic interpretation of analysis results, but predictions or decisions taken are not completely relevant or accurate.	1
		The analysis results can be interpreted correctly, but the predictions or decisions taken are still not relevant or contain several errors.	2
		Can interpret analysis results fairly well, predict results fairly accurately, and make relevant decisions even if there are some minor errors.	3
		Can interpret analysis results very precisely, predict possible outcomes accurately, and make highly relevant and effective decisions.	4

In this study, the researcher adjusted the test questions with the indicators of numeracy literacy skills, namely question number 1 to measure N1, question number 2 to measure N2, and question number 3 to measure N3. The following references are used to determine the students' level of numeracy literacy skills.

Table 2. Categories of Student Abilities

Value Range	Category
$80 \leq x \leq 100$	Tall
$50 \leq x < 80$	Currently
$0 < x < 50$	Low

Source: Katherina and Rini (2022)

Numeracy literacy skills are grouped into three categories, namely high, medium, and low. For research needs in analysing data, each student who represented the high, medium, and low categories was selected to describe the test and interview results. The data analysis techniques consist of data reduction, data presentation, and conclusion. At the data reduction stage, researchers filter information that is not relevant to the focus of the research. At the data presentation stage, relevant data is then

arranged in a narrative form that describes the main findings. At the conclusion drawing stage, researchers draw conclusions based on analysis of test and interview results, which are in line with the previously formulated research questions.

RESULTS & DISCUSSION

Results

The results of the analysis of grade XII students at SMA Negeri Kota Ambon show that the average score of the numeracy literacy ability test of 22 students is 58, with a moderate category. The number of students in each category is presented in Table 4 below.

Table 3. Student Scores Based on Numeracy Literacy Ability

Category	Value Range	Number of Students	Average Score
Tall	$80 \leq x \leq 100$	4	94
Currently	$50 \leq x < 80$	13	62
Low	$0 < x < 50$	5	20

Table 4 shows the achievement of the level of numeracy literacy skills of class XII students at SMA Negeri Kota Ambon; the majority of students are in the medium category with an average score of 62. However, there are still students who are able to reach the high category with an average score of 94, while at the low category level with an average score of 20. Suppose the number of students in each category is presented in the form of a percentage. In that case, 18.18% of students are in the high category, 59.09% of students are in the medium category, and 22.73% of students are in the low category.

The following table shows the percentage of students who answered correctly for each indicator.

Table 4. Percentage of the Number of Students Who Answered Correctly for Each Indicator

Code	Indicators of Numeracy Literacy Ability	Question Number Description	Percentage
N1	The ability to use various numbers or basic mathematical symbols to solve problems in everyday life.	1	22.73%
N2	Ability to analyse information in various forms (graphs, tables, charts, diagrams, etc.).	2	27.27%
N3	The ability to interpret the results of problem analysis to predict possible outcomes and make appropriate decisions.	3	22.75%
Average			22.58%

Table 4 shows that not all students can meet the three indicators of numeracy literacy skills in solving statistics problems. N1 and N3 have the same percentage and have a difference of 4.54% with N2. The following will present the results of research on students' numeracy literacy skills through work results and interview excerpts on questions 1, 2, and 3, with the code ST as a high-ability subject, SS as a medium-ability subject, and SR as a low-ability subject. First, the results of ST's work will be presented in Table 5, and interview excerpts will continue to emphasise the results of ST's work.

Table 5. ST Work Results

Answer Number 1 for N1

<p>→ Jumlah penduduk</p> <p>* Jangkauan</p> $J = x_{\max} - x_{\min}$ $= 270,20 - 97,02$ $= 173,18$	<p>* Mean</p> $\bar{x} = \frac{\text{Jumlah Data}}{\text{Banyak Data}}$ $= \frac{97,02 + 119,21 + 147,49 + 179,38 + 206,26 + 237,63 + 270,20}{7}$ $= \frac{1257,19}{7}$ $= 179,59$	<p>The ability to use various numbers or basic mathematical symbols to solve problems in everyday life.</p>
---	--	---

Answer Number 2 for N2

Pernyataan	Benar	Salah
Jumlah penduduk miskin paling banyak berada di Pulau Jawa.	✓	
Jumlah penduduk miskin di Pulau Kalimantan lebih banyak daripada di Pulau Maluku-Papua.		✓
Urutan Pulau dengan jumlah penduduk miskin terendah ke tertinggi yaitu Pulau Kalimantan, Pulau Bali-Nusa Tenggara, Pulau Sulawesi, Pulau Maluku-Papua, Pulau Sumatera, dan Pulau Jawa		✓
Jangkauan jumlah penduduk miskin Maret 2020 – Maret 2024 adalah 2,32		✓
Jumlah penduduk miskin rendah ada pada bulan Maret 2019		✓

Ability to analyze information in various forms (graphs, tables, charts, diagrams, etc.).

Answer Number 3 for N3

<p>Dari hasil simpulan saya, luas lahan dan produksi padi pada tahun 2022 dan 2023 mengalami perubahan. Dimana dapat dilihat untuk luas panen 2022 sekitar 6,45 juta hektar dan pada 2023 sekitar 6,16 juta hektar. Hal ini berarti luas panen mengalami penyempitan, dan dapat membuat kesulitan dalam menanam padi. Sedangkan produksi padi 2022 sekitar 54,75 juta ton GKG dan pada 2023 sekitar 53,63 juta ton GKG. Artinya produksi padi mengalami peningkatan.</p> <p>Maka, petani harus memproduksi lebih banyak produk lagi, namun luas panen semakin menyempit. Hal ini membutuhkan bahwa kebutuhan manusia lebih banyak dibandingkan dengan luas panen yang ada.</p>	<p>The ability to interpret the results of problem analysis to predict possible outcomes and make appropriate decisions.</p>
--	--

The results of ST's work for question number 1, presented in Table 5, show that ST can understand the questions given by using mathematical symbols according to the context of the problem, namely, to calculate the range and mean. ST can use and understand mathematical symbols, namely J as range and \bar{x} as average, ST's work results also show the use of correct formulas, as well as the correct calculation process and results. Excerpts from the interview with ST are presented below.

Researcher : Good. So, how do you determine the range and mean of the data presented in the infographic?

ST : Okay, bro. First of all, let us focus on the problem of determining the range. To determine the range, we need to know the formula first, where the formula for the range is $\text{range} = x_{\max} - x_{\min}$. Based on the data presented, we know that the data with the highest value is in the last data with the symbol x_{\max} 270.20 and the data with the lowest value is in the first data with the symbol x_{\min} which is 97.02. After that, from the known values in the data, you substitute it into the range equation $= x_{\max} - x_{\min} = 270,20 - 97,02 = 173,18$.

Researcher : What does it mean, little brother?

ST : Oh yes, if the mean is the same, first we have to know the formula, where, the formula to determine the average value or mean is $\bar{x} = \frac{\text{Jumlah Data}}{\text{Banyak Data}}$. After that, based on the data presented, you know that the number of data points is seven, then from all the data available, you add it up and then divide the result by the number of data points, so what you get is $\bar{x} = \frac{1257,19}{7} = 179,59$. So, the mean value is 179.59, brother.

Answer number 2 shows that ST can analyze the information obtained from the diagram and provide the correct check mark on each statement contained in the table. To prove the truth of the check mark, the following is an excerpt from an interview with ST on the second statement.


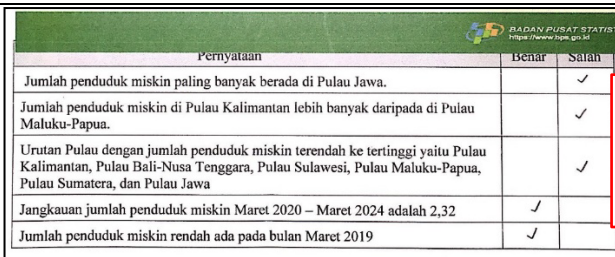
- Researcher : Okay, then, for the second statement, why did you choose that statement as wrong?
ST : The younger sibling chose the statement incorrectly, because based on the data presented in the infographic, Maluku-Papua Island should have more poor people, with a total of 1.51, compared to Kalimantan Island with a total of 0.94. In contrast, the second statement states that the number of poor people on Kalimantan Island is greater than on Maluku-Papua Island. However, the statement is automatically incorrect because it contradicts the data presented.

Answer number 3 shows that ST can provide a correct conclusion according to the results of the diagram analysis in question number 3. An excerpt from the interview with ST is presented as follows.

- Researcher : In question number 3, what can you conclude?
ST : Oh, to my brother, actually, the conclusion of the data presented in this infographic has been conveyed in my answer, but I want to add that even though it has been checked. However, if I am allowed to add, then the conclusion is that apart from that, based on the existing data, we can see that in 2023, there was a decline in both the harvested area and rice production, compared to 2022. This decline shows that agricultural conditions are facing challenges, maybe due to weather factors, climate change, or other problems, such as the lack of land available for planting rice. Uh.. so brother, in my opinion, this decline could affect the price of rice and the welfare of farmers if the price of rice becomes unstable, brother.

Second, the results of SS's work are presented in Table 6, and interview excerpts are used to confirm the results of SS's work.

Table 6. SS Answers

Answer Number 1 for N1	
	<p>Can use numbers correctly, but there are some minor errors (use of mathematical symbols) or application that is not entirely appropriate to the context of the problem.</p>
Answer Number 2 for N2	
	<p>Can recognize basic information from graphs, tables, charts, or diagrams, but cannot draw accurate conclusions or still makes many errors.</p>
Answer Number 3 for N3	

<p>* Luas panen padi : pada tahun 2022, luas panen padi di pertanaman sebesar 10,20 juta hektar, mengalami penurunan sebanyak 25,79 ribu hektare atau 2,45% dibandingkan luas panen padi di tahun 2021 yg sebesar 10,45 juta hektare.</p> <p>* produksi padi : pada tahun 2022, produksi padi di pertanaman sebesar 33,63 juta ton GKG, mengalami penurunan sebanyak 1,12 juta ton GKG atau 2,05 persen dibandingkan produksi padi di tahun 2021 yang sebesar 34,75 juta ton GKG.</p> <p>* Produksi Beras : produksi beras pada tahun 2022 untuk dikonsumsi pangan penduduk di pertanaman sekitar 30,90 juta ton, mengalami penurunan sebanyak 61,09 ribu ton / 2,05 persen dibandingkan produksi beras di tahun 2021 yang sebesar 31,51 juta ton.</p>	<p>Can interpret analysis results very precisely, predict possible outcomes accurately, and make highly relevant and effective decisions.</p>
--	---

Table 6 shows that in question number 1, SS can understand the given question by knowing how to get the range result. However, the mathematical symbol used is not correct. Namely, x_n is used by SS to express x_{\max} , and x_1 is used by SS to express x_{\min} . Based on the interview excerpt presented below, SS incorrectly mentions the lowest value, namely in the question data 97.02, but SS states that the lowest value is 97.2. SS shows inconsistent results in the work process; of course, it will produce different final results. In addition, SS tries to explain the use of the range formula, which states that x_n can be assumed as x_{\max} . In mathematical symbols, of course, it will have a different meaning. This has a truth value if x_n is replaced with x_7 , as the seventh data sequence that has the maximum value in the data. The question is asked to determine the mean, but SS does not show the results of the work to determine the mean.

- Researcher : So, what alternatives do you use to solve this problem?
- ST : According to your answer, there is a bar chart, where we use the range formula, where the range formula is $\text{range} = x_n - x_1$, now the highest value here is 270.20. The lowest is 97.2, where x_n the highest value is subtracted from the lowest value, which is $270.20 - 97.2$, which produces 173.18.
- Researcher : Okay, bro, but is not that range $x_{\max} - x_{\min}$? Why do you use x_n and x_1 ? Can you explain?
- ST : Oh yes, thank you, brother, why do I use x_n and x_1 , because I see from the bar chart that there are x_n many terms where the bar chart also has seven brothers, so you use $x_n - x_1$ brothers, that is what you think. Because the range is the same as $x_{\max} - x_{\min}$ so just assume the highest value is subtracted from the lowest value. So there is indeed a possibility of error, but the range can also have many terms. Here you use many, eh, which formula do you use $x_{\max} - x_{\min}$, because from the results, the term with the most is 7, then subtracted from *one*, so from the bar chart there are 7 bar charts.

Answer number 2 shows that SS still has many errors in analyzing information in the diagram. For example, in the second statement, SS checked wrong, but gave a reason that was still wrong in the process of calculating the number of poor people in Maluku-Papua, which should be 1.51. SS conveyed the poor population in rural areas only, based on the following interview excerpt.

- Researcher : Okay, little brother. In the second statement, why did you choose the wrong answer?
- ST : Well, the second answer, the younger sibling's reason, is that the poor population in Kalimantan Island is recorded at 0.94 million, while in Maluku-Papua Island, it only reaches 1.35 million. So, the poor population in Maluku and Papua is greater.

Answer number 3 shows that SS has been able to draw a correct conclusion according to the information obtained from the diagram presented in the question. In the following interview excerpt, SS only made a mistake in stating 2.45% as 2.45 million hectares as a decrease in harvest area from 2022 to 2023.

- Researcher : Now, try to explain the answer you wrote.

In question number 3, SR did not provide an answer related to the question presented. During the interview, the researcher tried to ask SR about the conclusion in question number 3, but SR had difficulty reading the data in the infographics presented. The following is an excerpt from the interview with SR.

Researcher : Why didn't you answer question number 3?

ST : Eh .. That is it, bro, I apologize, bro. I have difficulty reading the data presented in your diagram or infographic. This is what makes me unable to provide a conclusion from the data you presented.

Discussion

Maulidina & Hartatik (2019) found that high-ability students can use various numbers and symbols in mathematics correctly. This opinion was found by researchers when analyzing the work results of high-ability subjects, namely, high-ability subjects are able to state and solve problems in everyday life using numbers or mathematical symbols correctly. They are able to interpret each mathematical symbol used by re-explaining the work process. High-ability subjects are also able to interpret diagrams through the analysis process, by providing appropriate reasons related to giving a check mark for statements that are true or false, according to the data presented in the diagram. This is in line with the opinion of Amelia & Lestari (2021), who said that high-ability students tend to be better at analyzing questions accurately.

In the process of analyzing data through data presented in diagram form, highly skilled subjects can interpret the analysis results of a diagram correctly and draw relevant conclusions. Apart from providing conclusions on the results of data analysis in the form of infographics, highly skilled subjects were able to relate the data obtained to real-life contexts that occur in the agricultural sector in Indonesia. This is in line with the results of the analysis of Mahmud & Pratiwi's (2019) research, which shows that students who can conclude show high numeracy literacy abilities.

Related to the indicators of numeracy literacy skills, it was found that high-ability subjects were able to use various numbers or basic mathematical symbols in solving problems in everyday life, analyze information in various forms (graphs, tables, charts, diagrams, etc.), and were able to interpret the results of problem analysis to predict possible outcomes and make the right decisions. This is in line with the results of research (Maulidina & Hartatik, 2019) which showed that high-ability subjects were able to meet all indicators of mathematical communication skills and were correct in solving problems, namely high-ability subjects were able to use various numbers or symbols related to basic mathematics to solve problems in the context of everyday life, were able to analyze information presented in various forms (graphs, diagrams, tables, charts, etc.), and were able to interpret the results of the analysis to predict and make the right decisions.

Furthermore, subjects with moderate abilities are not fully able to state and solve problems in everyday life using numbers or mathematical symbols, as shown by several errors in solving the problems. In line with the opinion of Sidik & Waki (2020) that students have difficulty in interpreting the information in the questions, so that students are less able to translate the meaning of the questions into the right mathematical symbols.

In addition, subjects with moderate abilities are not yet fully able to analyze diagrams. The ability to analyze diagrams to state the truth of a statement is still an obstacle for subjects with moderate abilities, which is caused by a lack of literacy. However, subjects with moderate abilities are already able to interpret the results of problem analysis in order to predict possible outcomes and make the right decisions. This is in line with the opinion of Fauzi et al. (2021) that low reading ability, which is reflected in the lack of understanding and analysis of the information contained in the questions, is one of the factors causing the suboptimal development of numeracy literacy skills.

In general, subjects with moderate abilities are not yet able to use various numbers or basic mathematical symbols in solving problems in everyday life, are not yet able to analyze information in various forms (graphs, tables, charts, diagrams, etc.), and are able to interpret the results of problem

analysis in order to predict possible outcomes and make the right decisions. This is in line with the results of Jazilah's (2024) study. Looking at the results of the numeracy literacy ability test, it is known that most students tend to make mistakes when making calculations and are not careful when reading the information presented in the questions.

In low-ability subjects, they are not fully able to use numbers or mathematical symbols to solve problems in everyday life. This finding is in line with Muslimah & Pujiastuti (2020) in their research results that the higher the numeracy literacy ability, the more accurate in solving problems; conversely, the lower the numeracy ability, the lower the accuracy in answering questions.

In analyzing information, low-ability subjects are not yet fully able to analyze information in various forms (graphs, tables, charts, diagrams, etc.). In addition, low-ability subjects are not yet able to interpret the results of problem analysis in order to predict possible outcomes and make decisions. This is in line with the opinion of Hermalindawati & Marlina (2021), who said that students face difficulties in understanding and processing data related to diagrams.

Regarding the indicators of numeracy literacy skills, it was found that low-ability subjects were not yet able to use various numbers or basic mathematical symbols in solving problems in everyday life, were not yet able to analyze information in various forms (graphs, tables, charts, diagrams, etc.), and were not yet able to interpret the results of problem analysis in order to predict possible outcomes and make the right decisions. This is in line with the results of Rezky et al.'s research (2022), which showed that low-ability students had not fully met the indicators of numeracy literacy skills.

CONCLUSION

Based on the results of the research and discussion described regarding the numeracy literacy skills of class XII students at SMA Negeri Kota Ambon in solving statistics problems, it shows that all indicators of numeracy literacy skills have not been met optimally. It can be said that the numeracy literacy skills of students are still relatively low. Of the 22 students who were in the research sample, the average value of the numeracy literacy test was 58. In addition, the percentage of accuracy in each indicator is also relatively low, namely the ability to use various numbers or basic mathematical symbols in solving problems in everyday life, obtained a percentage of 22.73%; the ability to analyze information in various forms (graphs, tables, charts, diagrams, etc.), obtained a percentage of 27.27%; and the ability to interpret the results of problem analysis in order to predict possible outcomes and make the right decisions, obtained a percentage of 22.75%. Based on the results of this study, the researcher recommends that mathematics teachers in schools focus more on developing students' numeracy literacy skills by introducing various types of questions that can train these abilities in a varied way, in order to improve students' understanding and abilities as a whole.

REFERENCES

- Ambarwati, D., & Kurniasih, MD (2021). The influence of problem-based learning assisted by YouTube media on students' numeracy literacy skills. *Cendekia Journal: Mathematics Education Journal*, 5(3), 2857-2868. <https://doi.org/10.31004/cendekia.v5i3.829>
- Arahmah, F., Banindra Yudha, C., & Ulfa, DM (2021). Improving numeracy literacy skills in mathematics through the student facilitator and the explanation method. *Proceedings of the National Seminar on Education STKIP Kusuma Negara III SEMNARA 2021*, 209–218.
- Amelia, KNSE, & Lestari, KE (2021). Analysis of the mathematical literacy ability of grade x high school students in solving PISA problems. *Majamath: Journal of Mathematics and Mathematics Education*, 4, 136-45.

- Ekowati, DW, Astuti, YP, Utami, IW, Mukhlishina, I., & Suwandayani, BI (2019). Numeracy literacy in Muhammadiyah elementary schools. *ELSE (Elementary School Education Journal: Journal of Elementary School Education and Teaching*, 3(1), 93. doi:<https://doi.org/10.30651/else.v3i1.2541>
- Fauzi, FG, Khoirunnisa, K., Melyana, F., Rahmawati, D., Yasmin, S., & Nurrahmah, A. (2021). Analysis of numeracy literacy of grade VIII students at Petri Jaya Middle School, East Jakarta, on Algebra content. *Himpunan: Scientific Journal of Mathematics Education Students*, 1(2), 83–91.
- Han, W. (2017). *Supporting Materials for the Numeracy Literacy Movement*. Ministry of Education and Culture. 13.
- Hermalindawati, H., & Marlina, M. (2021). Improving student interest and learning outcomes with problem-solving models in mathematics learning in elementary schools. *Basicedu Journal*, 5(5), 4361-4368.
- Jazilah, F.V. (2024). Analysis of students' numeracy literacy ability in solving statistics questions. *Postulates (Journal of Innovation in Mathematics Education)*, 4(1), 96-111.
- Mahmud, MR, & Pratiwi, IM (2019). Students' Numeracy Literacy in Unstructured Problem Solving. *Kalamatika: Journal of Mathematics Education*, 4(1), 69–88. <https://doi.org/10.22236/kalamatika.vol4no1.2019pp69-88>
- Maulidina, AP, & Hartatik, S. (2019). Profile of numeracy ability of elementary school students with high ability in solving mathematical problems. *Journal of Basic Education (JBPD)*, 3(2).
- Murnane, B., Sawhill, I., & Snow, C. (2012). Literacy challenges for the twenty-first century: Introducing the issue. *The Future of Children*, 22 (2), 3–15.
- Muslimah, H., & Pujiastuti, H. (2020). Analysis of students' mathematical literacy ability in solving mathematical problems in the form of story problems. *Journal of Mathematics and Science Education*, 8(1), 36-43.
- OECD. (2023). *PISA 2022 Results: The State of Learning and Equity in Education*. Pisa 2022, I, 491.
- Rezky, M., Hidayanto, E., & Parta, IN (2022). Students' numeracy literacy skills in solving cultural context questions on geometry topics at the junior high school level. *AKSIOMA: Journal of Mathematics Education Study Program*, 11(2), 1548–1562.
- Sidik, GS, & Wakih, AA (2020). Elementary school students' mathematical learning difficulties in integer arithmetic operations. *NATURALISTIC: Journal of Educational and Learning Research Studies*, 4(1), 461–470. <https://doi.org/10.35568/naturalistic.v4i1.633>
- Silitonga, RY, Ratumanan, TG, & Palinussa, AL (2023). Numeracy literacy and its development for teachers in the Tehoru district. *Komatika: Journal of Community Service*, 3(1), 29-34.
- Yuliyani, R., Alamsyah, N., & Awaludin, AAR (2017). The influence of interest and learning habits on students' advanced statistics learning achievement. *Journal of Mathematics Education Research*, 1, 86–93.
- Wulandari, MD (2021). Management of numeracy literacy-oriented learning in elementary schools in curricular and extracurricular activities. *Journal of Thought and Development*, 9(2), 116–131. <https://ejournal.umm.ac.id/index.php/jp2sd/article/view/17906>

This page intentionally left blank.