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EXPLORING OF JUNIOR HIGH SCHOOL STUDENTS' STATISTICAL LITERACY ABILITIES IN SOLVING STATISTICAL PROBLEM

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Abstrak

Literasi statistik sangat penting di era digital, di mana data memengaruhi pengambilan keputusan. Namun, siswa di Indonesia masih kesulitan dalam menafsirkan dan mengevaluasi informasi statistik secara kritis. Penelitian ini bertujuan untuk mengeksplorasi kemampuan literasi statistik siswa kelas IX di salah satu SMP Negeri di Bandung. Dengan menggunakan metodologi fenomenologi, penelitian ini bertujuan untuk memberikan gambaran komprehensif tentang kemampuan siswa dalam literasi statistik, dan mengidentifikasi tantangan yang mereka hadapi. Data dikumpulkan melalui tes, wawancara, dan observasi, dengan empat siswa dipilih untuk wawancara mendalam berdasarkan tanggapan tes berbeda. Studi ini berfokus pada lima indikator: memahami komponen statistik, menafsirkan pesan, mengkomunikasikan pesan, mengambil keputusan, dan mengevaluasi informasi statistik secara kritis. Hasilnya menunjukkan tingkat literasi statistik yang bervariasi di kalangan siswa, dengan 72,5% memahami komponen statistik tetapi mengalami penurunan kemampuan dalam menafsirkan (65,2%), berkomunikasi (41,7%), membuat keputusan (38,9%), dan mengevaluasi informasi secara kritis (38,0%). Analisis mendalam terhadap respons siswa menggambarkan kesalahan konseptual dan tantangan dalam menerapkan konsep statistik pada skenario pengambilan keputusan praktis. Studi ini menekankan pentingnya mengembangkan keterampilan analitis dan menerapkan konsep statistik dalam kehidupan sehari-hari untuk meningkatkan kemampuan siswa dalam mengevaluasi informasi secara kritis dan membuat keputusan yang tepat.

Kata kunci: : Fenomenologi; literasi statistik; masalah statistika.

Abstract

Statistical literacy is crucial in the digital era, where data influences decision-making. However, Indonesian students still struggle with interpreting and critically evaluating statistical information.This research aims to explores the statistical literacy abilities of ninth-grade students in a public junior high school in Bandung. Employing a phenomenological methodology, the study aims to provide a comprehensive description of students' proficiency in statistical literacy, identifying challenges they encounter. Data was collected through tests, interviews, and observations, with four students selected for in-depth interviews based on distinct test responses. The study focuses on five indicators: understanding components of statistics, interpreting messages, communicating messages, making decisions, and critically evaluating statistical information. Results indicate a varying level of statistical literacy among students, with 72.5% understanding statistical components but decreasing proficiency in interpreting (65.2%), communicating (41.7%), making decisions (38.9%), and critically evaluating information (38.0%). Detailed analysis of student responses illustrates conceptual errors and challenges in applying statistical concepts to practical decision-making scenarios. The study emphasizes the importance of developing analytical skills and applying statistical concepts in everyday life to enhance students' ability to critically evaluate information and make informed decisions.

***Keywords**: Phenomenology; statistical literacy; statistical problem.*

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INTRODUCTION

The ability to understand, evaluate, and effectively transmit statistical data and messages is referred to as statistical literacy (Setiani & Suyitno, 2021). It is often understood to mean having the capacity to evaluate statistical data critically, involving essential skills such as organizing data, creating tables, and handling diverse data types (Callingham&Watson, 2017; Koga, 2022). Incorporating statistical literacy into education poses challenges for educators, and practical ideas and engaging learning activities are needed to enhance it in the classroom. It is imperative to educate students, particularly those in primary school, in statistical literacy to prepare them for active participation in a society where decisions are frequently influenced by statistical reasoning (Aziz & Rosli, 2021). There is a growing recognition of the importance of integrating statistical literacy into the mathematics curriculum to acknowledge its relevance in both daily life and professional settings (Sharma, 2017). Collaboration among various entities, including educational institutions, statistical agencies, associations, and the media, is crucial for improving statistical literacy, with increased collaboration expected to yield more positive outcomes (Azis & Dahlan, 2024).

We are living in an era where data is widely available, with organizations like national statistical offices, Eurostat, the OECD (Organisation for Economic Co-operation and Development), and the United Nations striving to make their data publicly available (Radermacher, 2020). The advancement of technology and communication has expanded the reach of statistical information, making it more widely accessible through mainstream media (Monteiro & Carvalho, 2023). Information based on statistics is commonly shared in the media, but individuals lacking a statistical background can still convey such information and make decisions. Comprehending and interpreting statistical data requires more than basic literacy; it necessitates a level of statistical literacy (Risqi & Rini Setianingsih, 2021). Statistical literacy is crucial for active participation in the Fourth Industrial Revolution era (Prodromou & Dunne, 2017). Critical statistical analysis is a necessary skill for people to engage in productive social interactions. In order to develop this ability, it is imperative that youth across all educational levels begin to have their statistical literacy improved (Gonda et al., 2022). Without introducing children to various facets of statistical literacy throughout their educational journey, exposing them to statistics in their environment could be a futile endeavor, as students may not develop insights into the information's substance (Singer et al., 2015). In order to foster statistical literacy skills among junior high school students, it is essential to initially assess them using indicators related to: a) Understanding the components of statistics in mathematics; b) Interpret messages or statistical information; c) Communicate messages or statistical information; d) Make decisions from statistical information; e) Critically evaluate statistical information.

Based on a literature review, Indonesian students' statistical literacy is still relatively low. In fact, difficulties in learning statistics persist even at the university level. Maryati & Priatna (2018) suggest that students' low statistical literacy may stem from an inadequate understanding of

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fundamental concepts. As a result, other literacy skills, such as data reading, data processing communication, and presenting processed data, are prone to errors when solving school-related problems.

Similarly, research by Fitri et al. (2023) found that most high school students struggle to interpret data presented in histograms. Their ability to evaluate and draw conclusions from data is not well-supported by strong mathematical calculations, which in turn affects their decision-making skills.

A study by Setiawan & Sukoco (2021) on undergraduate students at the elementary level revealed similar findings. Many students face challenges in selecting the appropriate statistical methods to clearly represent data. Moreover, when it comes to data visualization, a significant number of students fail to create effective graphs that highlight differences between two data groups.

A large number of studies on statistical literacy were carried out. In elementary, middle, and college education, for example: Fitri et al. (2023), Irwandi et al. (2022), Maryati & Priatna (2018), Setiawan & Sukoco (2021), and other research. Based on previous literature reviews, it appears that there has been no research that specifically investigates statistical literacy skills to the fifth level, namely critically evaluating statistical information. This creates a knowledge gap or novelty which becomes the background for researchers to carry out in-depth research related to this aspect. Analyzing how the study description correlates with statistical literacy is crucial for gathering comprehensive information and accurate data. This article describes the statistical literacy abilities of junior high school students by analyzing students' answers according to predetermined statistical literacy ability indicators. As well as analyzing allegations of student difficulties in understanding statistical material. The researcher presents the findings in the results and discussion section after analyzing the students' responses.

METHODS

This qualitative research employs phenomenology as its methodology, focusing on elucidating the nature of a given phenomenon. Phenomenology, according to Neubauer et al. (2019), is particularly well-suited for delving into the fundamental essence or structure of life experiences. Qualitative research, according to Lim (2024), aims for a thorough understanding of phenomena using words and language within a scientific framework, employing various methods. In essence, qualitative research can be characterized as an approach dedicated to exploring and comprehending the meaning attributed to a social or humanitarian issue by individuals or groups, as defined by Creswell (2014). This study focuses on examining ninth-grade students' proficiency in statistical literacy, specifically in the field of statistics. The primary goal is to offer a detailed description of students' abilities and explore any challenges they may face. In January 2024, a study was conducted with 30 participants from a public junior high school in Bandung. After obtaining participant consent, all students underwent the prescribed test. Subsequently, four students were chosen for in-depth interviews based on unique test responses, ensuring a comprehensive data collection for robust conclusions.

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The research used tests, interviews, and observations instruments. Among these, the main instrument was a statistical literacy test designed to assess students' ability to understand statistical components in mathematics, interpret and communicate statistical information, make informed decisions based on data, and critically evaluate statistical information. The test included validated long-answer questions with 83% validity, approved by mathematics education experts. Semi-structured interviews continued until saturation, aiming for rich information on participants' statistical literacy abilities and challenges.

The study followed a structured research design with four stages. In the Preparation Stage, research objectives were formulated, relevant literature was reviewed, instruments were designed, and validity testing was conducted. The Data Collection Stage involved selecting participants, administering a statistical literacy test to 30 students, analyzing results, and conducting in-depth interviews with four selected students. During the Data Analysis Stage, data was organized, coded, presented, and verified through triangulation. Finally, in the Conclusion and Reporting Stage, key findings were summarized, challenges identified, recommendations provided, and the research report finalized. Within the data analysis phase, three key activities were undertaken: data reduction, data presentation, and conclusion or verification (Samosir et al., 2023). Kakar et al. (2023) identified four dimensions for qualitative research validity: credibility, transferability, dependability, and confirmation. These dimensions are criteria for rigor and trustworthiness in research findings. To assess students' statistical literacy, the researchers used five questions aligned with indicators in Table 1.

Table 1. The indicator of statistical literacy

Numb	Indicator
1	Understanding the components of statistics in mathematics.
2	Interpret messages or statistical information.
3	Communicate messages or statistical information.
4	Make decisions from statistical information.
5	Critically evaluate statistical information.

RESULT AND DISCUSSION

The examination of test results reveals insufficient statistical literacy abilities in the subject. A significant number of students struggle with appropriate responses to the questions, indicating a low level of proficiency. Researchers assessed statistical literacy from five test questions, analyzing the percentage of correct answers (refer to Table 2).

Table 2. The percentage of students answering correctly

Question Numb.	Indicator	%
1	Understanding the components of statistics in mathematics.	72.5
2	Interpret messages or statistical information.	65.2
3	Communicate messages or statistical information.	41.7
4	Make decisions from statistical information.	38.9
5	Critically evaluate statistical information.	38.0

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From Table 2, it can be seen the percentage of students who answered correctly for each indicator. It can also be seen from the five indicators that it is easiest for students to work on statistical literacy questions with the indicator of understanding the components of statistics in mathematics being 72.5%. On the other hand, students had the most difficulty working on statistical literacy questions with the indicator of critically evaluate statistical information, namely only 38.0%.

Analysis of Student Answers Based on the Statistical Literacy Test. The question of number 1 is shown in Figure 1.

1. Untuk mengetahui rata-rata durasi penggunaan aplikasi media sosial oleh siswa kelas VIII A yang berjumlah 30 orang, seorang guru mengumpulkan data tentang durasi penggunaan aplikasi media sosial oleh setiap siswa dan kemudian menghitung rata-rata dari data tersebut. Hasilnya menunjukkan bahwa rata-rata durasi penggunaan media sosial oleh siswa adalah 2,5 jam.
   Apa sajakah komponen (atau hal) yang diketahui pada wacana tersebut? Dengan menggunakan informasi pada wacana, manakah pernyataan berikut yang benar? Mengapa? Kemukakan alasannya!
   □ Lebih dari setengah jumlah siswa di kelas tersebut menggunakan aplikasi media sosial selama lebih dari 2 jam.
   □ Siswa yang menggunakan aplikasi media sosial selama 3 jam lebih banyak daripada siswa yang menggunakan aplikasi selama 2 jam.
   □ Total waktu penggunaan aplikasi media sosial oleh seluruh siswa adalah 75 jam.

Figure 1. The question of number 1

Based on Table 2, it can be seen that 72.5% of students were able to understand the components of statistics in mathematics. 27.5% of students could not understand the components of statistics in mathematics correctly. Figure 2 shows the outcomes of students' statistical literacy in understanding the components of statistics.

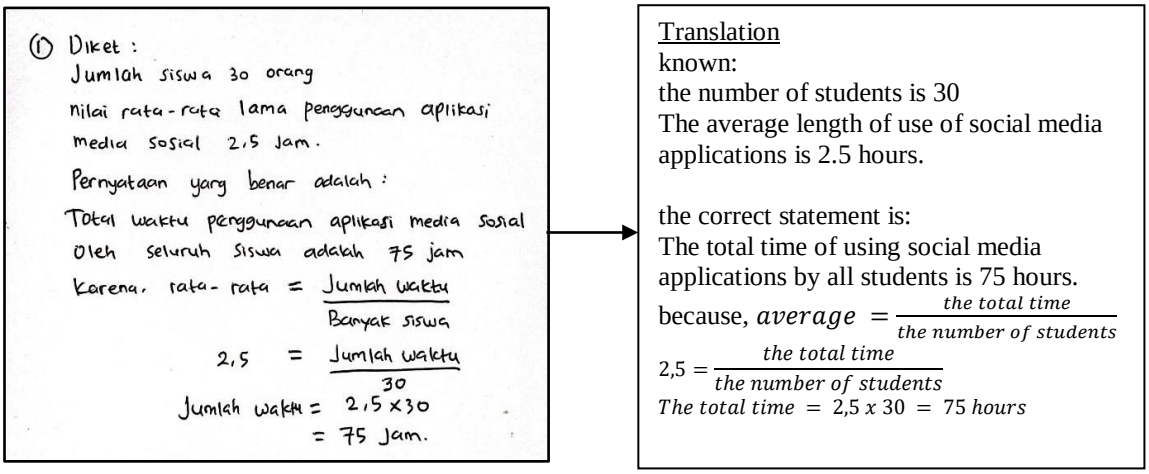

Figure 2a. The results of answer number 1

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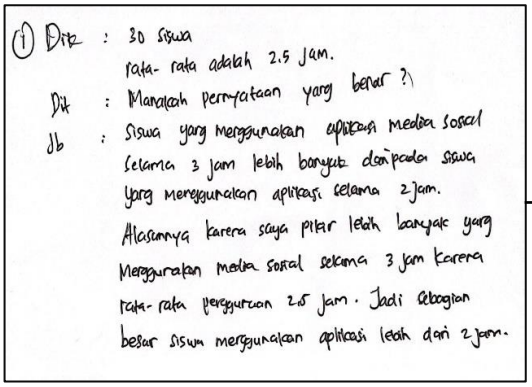


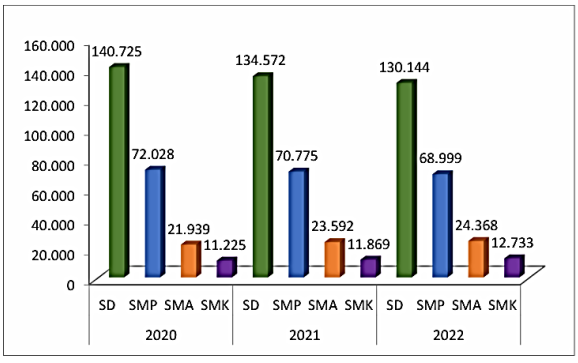
Translation
Known: 30 students
Average is 2,5 hours
Asked: which of the following statements is true? Answer:
More students who use social media applications for 3 hours than students who use the application for 2 hours. The reason is because I think more people use social media for 3 hours because the average usage is 2.5 hours. So most of the students use the app more than 2 hours

Figure 2b. The results of answer number 1

In analyzing the statistical components of social media application usage duration among 30 students in class VIII A, two student responses were considered. The first student (figure 2a) demonstrated a commendable grasp of statistical concepts, particularly the concept of average. This student correctly deduced that "The total time of using social media applications by all students is 75 hours," offering a well-supported explanation. The analysis exhibited a clear understanding of the average as the total time divided by the number of elements. Conversely, the second student's response (figure 2b) indicated a less accurate comprehension of statistical concepts. While this student successfully made statements about the duration of social media app usage, the rationale provided lacked clarity. The student asserted that more students used the app for 3 hours rather than 2 hours due to an average usage of 2.5 hours. However, the reasons provided did not fully manifest a profound understanding of statistical concepts.

The question of number 2 is shown in Figure 3.

2. Berikut ini adalah grafik perkembangan jumlah siswa di Sekolah Negeri menurut jenjang pendidikan dari tahun 2020-2022 di Kota Bandung.



Sumber: bandungkota.bps.go.id

Berdasarkan diagram tersebut, uraikan setiap pernyataan di bawah apakah benar atau salah, beserta alasannya!

a. Rata-rata jumlah siswa di sekolah negeri semua jenjang pendidikan pada tahun 2021 adalah 60.202.
b. Jumlah siswa di sekolah negeri pada jenjang SMA tahun 2022 mencapai dua kali lipat siswa pada jenjang SMK tahun 2022.
c. Median jumlah siswa pada tahun 2020 pada semua jenjang pendidikan adalah 56.983,5.

Figure 3. The question of number 2

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Based on Table 2, it can be seen that 65.2% of students were able to interpret messages or statistical information. 34.8% of students could not interpret messages or statistical information correctly. The results of students' statistical literacy in interpret messages or statistical information can be seen in Figure 4.

The data on the number of students in public schools from 2020 to 2022 was utilized to assess students' proficiency in interpreting diagrams. In Figure 4 (a), first point, students displayed a commendable understanding of averages, successfully calculating the average number of students in public schools for 2021. However, in question point b of Figure 4 (a), numerous students struggled with interpreting the diagram accurately. While acknowledging that the number of students in public schools at the SMA level in 2022 would not reach twice the number of students at the SMK level in 2022, calculation errors were prevalent. For instance, a student incorrectly computed twice the number of SMK students in 2022 as "2×24368=48736" instead of the correct calculation "2×12733=25466." Although the student's final answer was correct, the reasoning behind the interpretation of the data in the diagram was flawed.

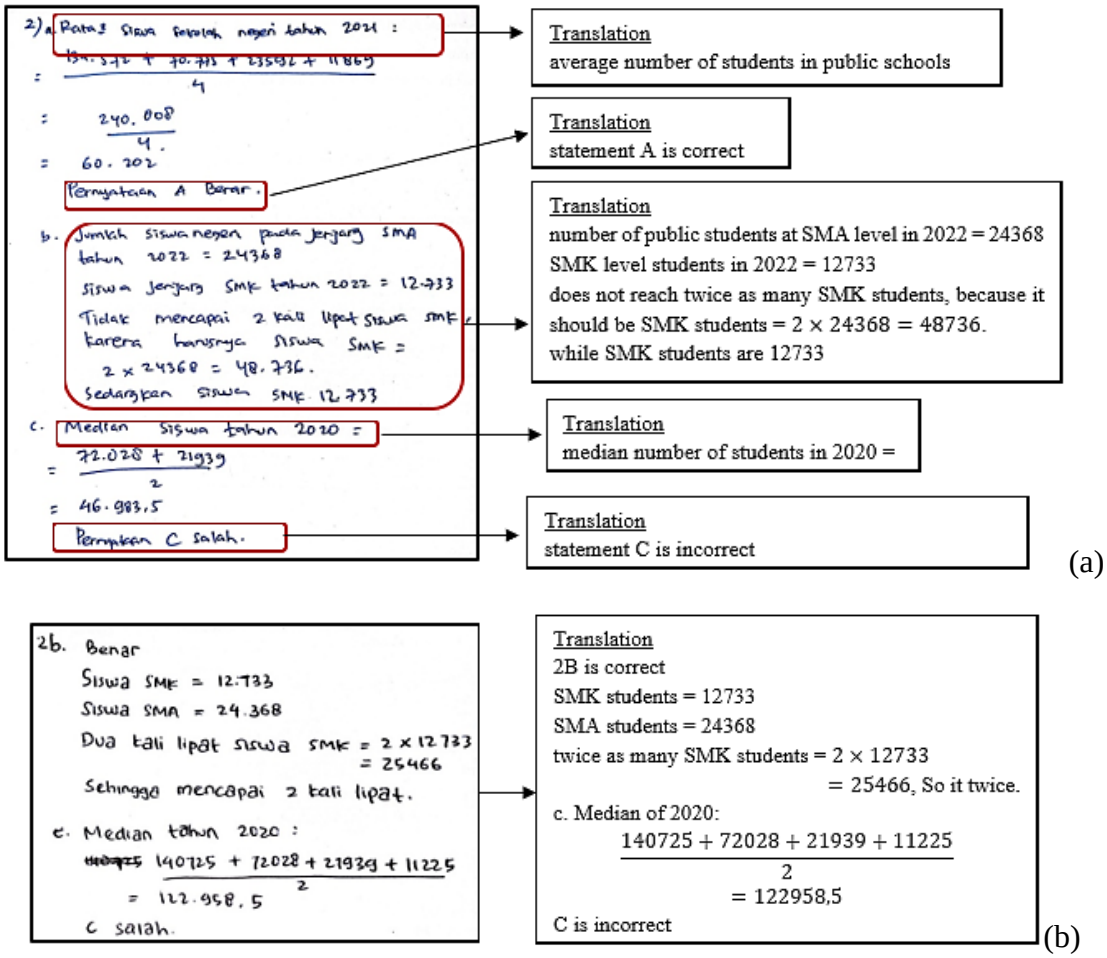

Figure 4. The results of answer number 2

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In an interview excerpt between the researcher and a student, discrepancies in understanding statistical information in diagram form were highlighted, emphasizing the importance of accurate interpretation alongside correct calculations.

The interview revealed a miscalculation in the student's reasoning. Initially, the student incorrectly multiplied two by the number of SMA students instead of SMK students. After reviewing the calculation, it was clarified that the correct formula should be 2 × 12,733 = 25,466, confirming that the number of SMA students in 2022 was not double the number of SMK students. The student acknowledged the mistake and corrected their understanding.

In Figure 4(b), while students correctly calculated "twice the number of SMK students = 2×12,733=25,466," they erroneously concluded that the number of SMA students should not reach twice the number of SMK students in 2022. The interview excerpt with a student highlighted this misinterpretation.

The interview highlighted a misunderstanding in the student's conclusion. Although the student correctly calculated 2 × 12,733 = 25,466, they initially misinterpreted the result, believing that the number of SMA students (24,368) had reached twice the number of SMK students. After clarification, the student realized the mistake and acknowledged the need to correct their conclusion.

In question c, students' proficiency in calculating the median varied. Figure 4(a), third point, demonstrated correct understanding, while Figure 4(b), third point, showcased an error. The mistake involved adding all the data and dividing by two instead of correctly arranging the 2020 student numbers (11,225, 21,939, 72,028, and 140,725) and selecting the middle value, yielding (21,939+72,028)/2=46,983.5.

The question of number 3 is shown in Figure 5.

3. Negara A, B, dan C memiliki jumlah penduduk yang setara, yakni sebanyak 15.000.000 orang. Berikut ini terdapat data tabel yang memperlihatkan bagaimana pendapatan penduduk per tahun terdistribusi di ketiga negara tersebut.

Negara A			Negara B			Negara C		
Pendapatan (Dolar)	Jumlah Penduduk	Persentase	Pendapatan (Dolar)	Jumlah Penduduk	Persentase	Pendapatan (Dolar)	Jumlah Penduduk	Persentase
≤10.000	1.000.000	6,7%	≤10.000	2.000.000	13,3%	≤10.000	1.500.000	10%
10.001-20.000	1.400.000	9,3%	10.001-20.000	2.400.000	16%	10.001-20.000	2.300.000	15,3%
20.001-30.000	2.000.000	13,3%	20.001-30.000	2.000.000	13,3%	20.001-30.000	1.000.000	6,7%
30.001-40.000	900.000	6%	30.001-40.000	1.500.000	10%	30.001-40.000	900.000	6%
40.001-50.000	1.500.000	10%	40.001-50.000	1.000.000	6,7%	40.001-50.000	1.500.000	10%
50.001-60.000	1.900.000	12,7%	50.001-60.000	900.000	6%	50.001-60.000	1.600.000	10,7%
60.001-70.000	1.800.000	12%	60.001-70.000	800.000	5,3%	60.001-70.000	1.200.000	8%
70.001-80.000	900.000	6%	70.001-80.000	900.000	6%	70.001-80.000	900.000	6%
80.001-90.000	2.000.000	13,3%	80.001-90.000	2.000.000	13,3%	80.001-90.000	1.800.000	12%
>90.000	1.600.000	10,7%	>90.000	1.500.000	10%	>90.000	2.300.000	15,3%

Penduduk diklasifikasikan berdasarkan pendapatan tahunannya menjadi dua kelompok:

- Penduduk dalam kategori "miskin" yaitu yang memiliki pendapatan tahunan ≤ 30.000 dolar.
- Penduduk dalam kategori "kaya" yaitu yang memiliki pendapatan tahunan > 90.000 dolar.

Dewan Ekonomi Internasional memiliki program yang bertujuan untuk mendukung negara-negara yang mengalami kesenjangan pendapatan penduduk. Mereka telah menetapkan Negara B sebagai prioritas untuk menerima bantuan dari Dewan Ekonomi Internasional.

Berdasarkan informasi statistik yang ada pada wacana, apakah penunjukan Negara B sebagai negara prioritas untuk menerima bantuan sudah benar? Ungkapkan alasannya!

Figure 5. The question of number 3

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Based on Table 2, it can be seen that 41.7% of students were able to communicate messages or statistical information. 58.3% of students could not communicate messages or statistical information correctly. The results of students' statistical literacy in communicate messages or statistical information can be seen in Figure 6.

Only one student, shown in Figure 6 (a), effectively conveyed the statistical information, highlighting that Country B deserved priority assistance due to significant income inequality. This student pointed out the concrete data, emphasizing the evident income mismatch in Country B, with 6.4 million "poor" residents and 1.5 million "rich." In Figure 6 (b), some students provided correct answers but overlooked the priority criteria for aid, focusing more on population size than income disparity. This resulted in less precise communication about prioritizing countries with the most significant gaps in income levels. Figure 6 (c) showcases incorrect responses from students, revealing a notable lack of comprehension of the question. The provided answer deviates significantly from the correct one.

An interview excerpt with the researcher and the student who responded to Figure 6 (c) sheds light on the misunderstanding.

The interview revealed that the student misunderstood the question, assuming that aid should not be given to Country B because it had a large number of wealthy individuals. The student did not initially consider the disparity between rich and poor as the key factor in determining aid priority. After clarification, the student acknowledged the misunderstanding, recognizing that the question focused on economic disparity rather than the total number of wealthy individuals. The student also mentioned that the question was too long and difficult to understand, which contributed to the confusion.

In class observation, students varied in motivation for question 3. Some rushed to avoid blanks, while others hesitated due to perceived complexity. Widespread difficulty signaled a general lack of understanding. Many skipped question 3, reducing statistical literacy and affecting problem-solving skills.

The question of number 4 is shown in Figure 7.

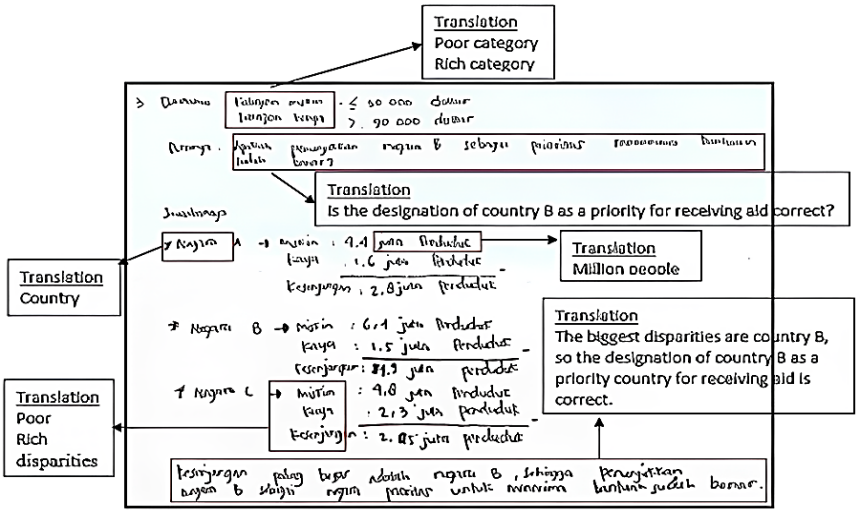

Figure 6a. The results of answer number 3

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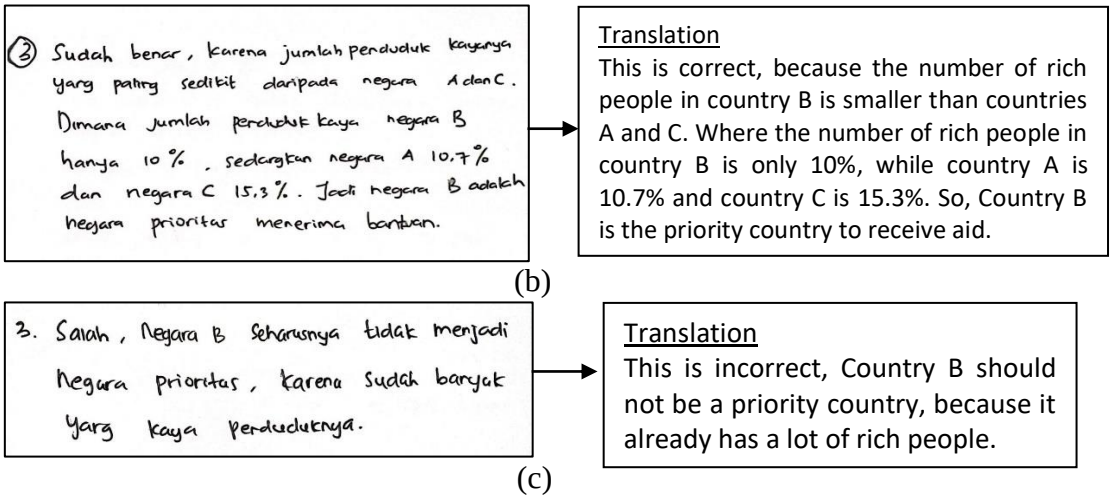

Figure 6**.** The results of answer number 3

4. Sebuah surat kabar menginformasikan tentang pendapatan delapan KK di Kecamatan Lembang dan Kecamatan Sukasari seperti yang tertera dalam tabel berikut. Surat kabar tersebut menyatakan bahwa kecamatan yang dinilai makmur adalah yang memiliki pendapatan rumah tangga lebih tinggi dan merata.

Pendapatan 8 KK di Kecamatan Lembang dan Kecamatan Sukasari per Bulan (Rp)	
Kecamatan Lembang	Kecamatan Sukasari
1.500.000	800.000
2.000.000	900.000
2.500.000	950.000
2.500.000	1.000.000
3.000.000	1.500.000
3.500.000	4.000.000
4.000.000	10.000.000
4.500.000	12.000.000

Menurut surat kabar tersebut, keluarga-keluarga di Kecamatan Sukasari lebih makmur dibandingkan dengan keluarga-keluarga di Kecamatan Lembang. Apakah kamu sependapat dengan pernyataan surat kabar tersebut? Berikan alasan statistik yang mendukung keputusanmu!

Figure 7. The question of number 4

Based on Table 2, it can be seen that 38.9% of students were able to make decisions from statistical information. 61.1% of students could not make decisions from statistical information correctly. The results of students' statistical literacy in make decisions from statistical information can be seen in Figure 8.

In Figure 8 (a), only a few students, like the one depicted, accurately interpreted statistical information. This student correctly noted that while Sukasari District's average family income surpasses Lembang District's, the economic gap in Lembang is smaller. This is evident in the data, where 8 families in Lembang exhibit more evenly distributed and higher incomes in the millions, compared to Sukasari where many families still have uneven and lower incomes in the hundreds of thousands. Figure 8 (b) displays incorrect responses from students, as seen in an interview excerpt with a student who responded to Figure 8 (b).

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The interview revealed that the student initially assumed that prosperity was solely determined by higher income. However, after clarification, the student realized that income distribution also plays a crucial role. Although Sukasari District had a higher average income, Lembang had a more even income distribution, making it the more prosperous district. The student acknowledged the importance of considering both income level and equality in determining prosperity.

In the interview for Figure 8 (c), the student initially misunderstood prosperity, thinking Sukasari was wealthier due to higher income. However, after emphasizing the importance of income equality, the student recognized Lembang District as more economically equal. This underscores the significance of understanding that prosperity involves both high income and an equitable distribution in society. Likewise with answer 8 (b).

The question of number 5 is shown in Figure 9.

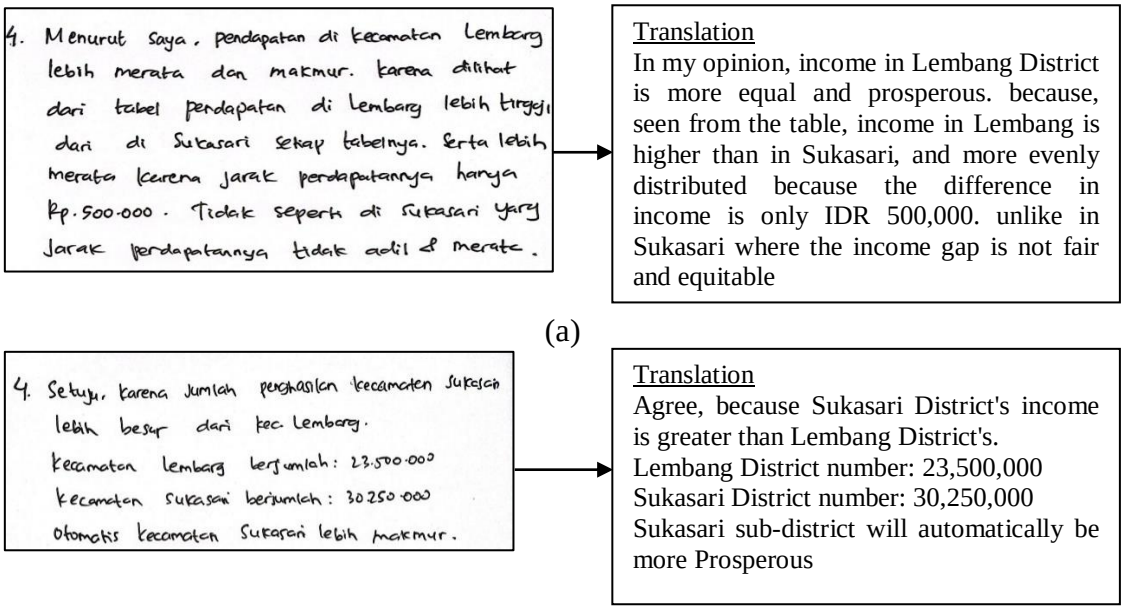

Figure 8. The results of answer number 4

5. Dalam rangka menyambut Hari Raya Idul Fitri, Ana dan Ibunya pergi ke pusat perbelanjaan untuk membeli baju baru. Mereka menemukan sebuah baju yang mereka suka dengan harga awal sebesar Rp400.000,00. Ternyata, ada tiga toko yang berbeda yang menjual baju yang sama dengan harga awal yang sama, tetapi dengan penawaran diskon yang berbeda. Berikut ini adalah informasi diskon untuk masing-masing toko:
   a. Toko A: Diskon 60% + tambahan diskon 10% untuk pelanggan yang melakukan pembayaran dengan kartu kredit.
   b. Toko B: Diskon 40% + 20%
   c. Toko C: Diskon 50% +10%

   Ana mengatakan kepada Ibunya bahwa baju yang mereka lihat di Toko B setelah mendapat diskon tidak terlalu mahal ataupun murah. Periksalah kebenaran pernyataan Ana disertai dengan alasannya!

Figure 9. The question of number 5

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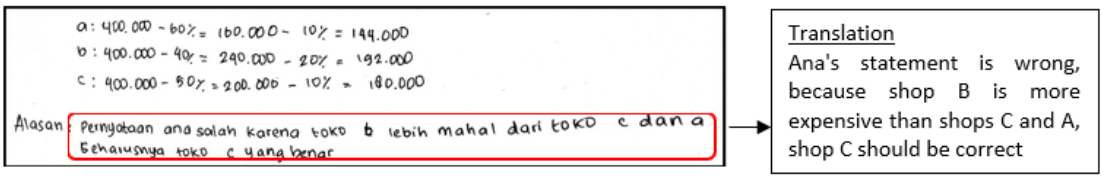
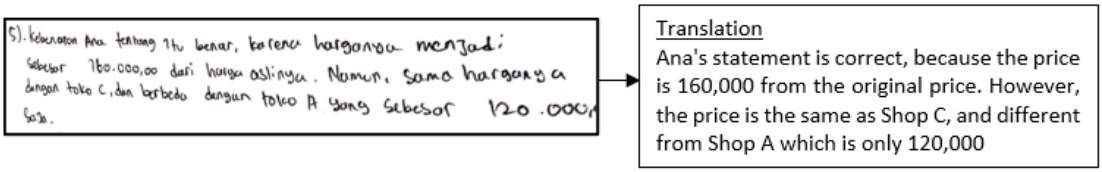
Based on Table 2, it can be seen that 38.0% of students were able to critically evaluate statistical information. 62.0% of students could not critically evaluate statistical information. The results of students' statistical literacy in critically evaluate statistical information can be seen in Figure 10.



(a)



(b)

Figure 10. The results of answer number 5

The analysis of students' statistical literacy in evaluating information reveals varying understanding levels. For instance, in a shopping assignment, students differ in selecting a moderately priced store for buying clothes. The correct student correctly calculates the price after discount for each store and concludes that store C charges IDR 180,000.00 after discount, which is neither too expensive nor cheap as we seen in Figure 10 (a). Even though the calculations were incorrect, as shown in Figure 10 (b), some students were unable to locate retailers with prices that were in the middle (median) and came to the conclusion that Store B was the best option. These students believed that a 40%+20% discount was equivalent to a 50%+10% discount.

The examination results presented in the article highlight a concerning trend in the statistical literacy abilities of students. The findings from the five test questions reveal a significant proportion of students struggling with various aspects of statistical literacy, ranging from understanding basic components to critically evaluating statistical information.

Question 1 assessed students' understanding of the components of statistics in mathematics, where 72.5% demonstrated proficiency. This indicates a relatively higher level of competence in basic statistical concepts. However, the analysis of student responses showcases the need for further emphasis on clarifying concepts such as averages, as illustrated by the misinterpretation in the second student's response. According to Irwandi et al. (2022) the ability to understand statistical components includes understanding symbols, statistical language, displaying data in graphical or tabular form, and making relationships between statistical data. Misunderstanding statistical components can lead to incorrect conclusions. Discussions and analyses like this help teachers pinpoint areas needing more focus in statistics education. In addition, an emphasis on

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understanding concepts and relationships between concepts in statistics can help students develop better statistical literacy skills to overcome challenges surrounding data analysis in everyday life (Ridgway, 2016).

Question 2 delved into the interpretation of messages or statistical information, with 65.2% of students answering correctly. The article highlights the challenges students faced in interpreting diagrams accurately. The interview excerpt underscores the importance of not only correct calculations but also the need for a thorough understanding of the data being presented. This misconception stemmed from a misunderstanding of the median concept. This error highlights the crucial need for a solid understanding of basic statistical concepts, particularly in calculating medians. Conceptual errors, such as using formulas inaccurately or misunderstanding concepts, often arise when students lack clarity on mathematical procedures or applications (Kurudirek et al., 2025). These errors align with research by Green & Blankenship (2015), which emphasizes that students' conceptual mistakes in statistics often stem from a lack of understanding of relevant concepts. Therefore, it is imperative to enhance the learning process, ensuring that students grasp and correctly apply statistical concepts for accurate interpretation of statistical information.

In Question 3, focusing on students' ability to communicate messages or statistical information, only 41.7% demonstrated proficiency. The varying quality of responses suggests a need for clearer communication strategies, as seen in Figure 3, where some students failed to prioritize countries based on income disparities. Weak statistical literacy reflects students' challenges in applying concepts (Utomo, 2021). Neglecting to read questions carefully hampers effective statistical message communication (Kovacs et al., 2021). This aligns with research by Maryati & Priatna (2018), revealing deficiencies in communication skills and statistical reasoning among junior high school students. Evaluating learning methods is crucial to minimize errors in student problem-solving.

Question 4 aimed at evaluating students' ability to make decisions from statistical information, and only 38.9% of students were successful. The interview excerpts reveal common misconceptions, such as equating higher income with prosperity without considering income distribution. This emphasizes the importance of comprehending the nuances of statistical information. Statistical knowledge is essential for understanding data and making informed decisions, enabling students to become intelligent consumers who can evaluate information critically (Fitri et al., 2023).

Lastly, Question 5 assessed students' critical evaluation of statistical information, with only 38.0% performing well. The analysis of students' ability to evaluate information in a real-life context, such as a shopping assignment, highlights the need for practical applications to enhance statistical literacy. Some students struggle to grasp mathematical discounting, posing a challenge in applying this knowledge to practical decisions in statistics. Hence, statistics education should prioritize enhancing analytical skills and applying statistical concepts in daily life for improved critical evaluation and informed decision-making (Felix & Felix, 2024).

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In conclusion, the article underscores the critical importance of addressing the identified deficiencies in statistical literacy among students. The findings suggest a need for targeted interventions, including clearer instruction on statistical concepts, practical applications, and improved communication strategies. Moreover, fostering a deeper understanding of statistical information and promoting critical thinking skills can contribute to enhancing students' overall statistical literacy. The implications of these findings extend beyond the classroom, emphasizing the relevance of statistical literacy in making informed decisions in various aspects of life.

CONCLUSION AND SUGGESTION

The statistical literacy analysis of junior high school students indicates a generally low level of understanding. While 72.5% of students grasped statistical components, their abilities declined in interpretation (65.2%), communication (41.7%), decision-making (38.9%), and critical evaluation (38.0%). These findings highlight the need for strengthening students' analytical skills and contextual understanding of statistical concepts. Variations in understanding, especially in practical decision-making scenarios, indicated a need for improved analytical skills. Strengthening statistical knowledge is vital for informed decision-making. This research recommends prioritizing the enhancement of analytical skills and practical application of statistical concepts in daily life. Emphasizing contextual understanding is crucial for improving junior high school students' ability to critically evaluate and make informed decisions based on statistical information.

For future research, it is recommended to explore the effectiveness of various teaching strategies in improving students' statistical literacy, particularly in the areas of communication, decision-making, and critical evaluation. Additionally, investigating the role of technology and digital tools in enhancing students' understanding of statistical concepts could provide valuable insights. Further studies could also examine the influence of different demographic factors, such as socioeconomic background and prior mathematical knowledge, on students' statistical literacy levels.

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