Analysis of the Tenth Grade Students' Numeracy Literacy Ability in Solving Contextual-Based Story Problems

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Abstract
The aim of this study was to describe the tenth-grade students' numeracy literacy ability in solving contextual-based story problems at SMK Negeri 4 Klaten in the 2022/2023 academic year. Taking research subjects using purposive sampling technique. The data collection techniques are documentation, tests and interviews. Based on the results of the study, it was obtained: students' numeracy literacy ability in identifying and understanding problems for students in the upper group had very good criteria (100%), students in the middle group had less criteria (50%) and students in the lower group had very poor criteria (0%); students' numeracy literacy ability in understanding and using symbols and numbers for group students with very good criteria (91.7%), middle and lower group students with very good criteria (87.5%); students' numeracy literacy ability in selecting and applying problem solving methods for students in the upper group had very good criteria (87.5%), students in the middle group had good criteria (79.2%), students in the lower group had good criteria (70.8%); as well as the ability of students' numeracy literacy in drawing and explaining the conclusions of the final results obtained from solving problems for students in the top group with very good criteria (91.7%), students in the middle and lower groups with good criteria (66.7%). In solving contextual-based word problems, students made several mistakes due to students' lack of accuracy and thoroughness both in reading the questions, writing answers and the calculation process. The implementation of the results of this study is that after the teacher knows the location of errors and factors that cause student errors in solving contextual-based story problems with numeracy literacy skills, the information can be used as a consideration in designing lessons and composing questions so that each numeracy literacy indicator can be achieved properly.
Keywords: Numeracy Literacy Ability; Contextual-Based Story Problems

Introduction

Numeracy literacy is a very important part of literacy because it is able to hone individual abilities to reason about problems that occur in everyday life (Pratiwi et al., 2020). Numeracy literacy ability includes the ability to use mathematical symbols and numbers appropriately to solve problems in everyday life as well as analyze information presented in the form of tables, charts, graphs, and others, which are then interpreted in decision-making (Han et al., 2017). Numerical literacy ability has important role in learning mathematics because they are not only related to the application of formulas but also the need for students' critical thinking processes in solving problems. Numeracy literacy ability must also be possessed by students because they can help them solve mathematical problems related to everyday life (Pulungan, 2022). That way, students with

numeracy and literacy skills have a great chance of success in the future because their application refers to the context of everyday life.

Numerical literacy skills can be developed through story problems (Mahmud, M. R. and Pratiwi, 2019). This agrees with Larasaty et al. (2018), who state that numeracy literacy skills are very closely related to word problems because students are required to have the skills to understand and analyze mathematical problems. Story problems are defined as questions that are presented in the form of stories and relate to everyday life (Utami and Zulkarnaen, 2019). Of the many math problems in the form of word problems, it turns out that contextual problems are more widely used to hone students' abilities. Contextual mathematical problems are mathematical problems that are directly related to real or abstract objects.

Relevant research related to numeracy literacy skills can also be seen in the following results. Description of students' numeracy literacy skills (Yustinaningrum, 2021). Numeracy literacy skill module based on local culture (Rahmadeni et al., 2023). Improving school literacy and numeracy literacy through blanded learning model in students (Dantes & Handayani, 2021). Numeracy literacy-based math problem training for high school students (Puspaningtyas & Ulfa, 2021). Students numeracy literacy skills in inclusive schools (Agustina & Moh Zayyad, 2023). Students' numeracy literacy in unstructured problem solving (Mahmud, M. R. dan Pratiwi, 2019). Analysis of class students' numeracy ability in solving AKM type problems on the subject of system of linear equations of three variables (Indra & Rahadyan, 2021).

In addition, strategies to improve numeracy literacy skills are found in the following research. Strategies for developing numeracy literacy in mathematics learning with HOTS problems (Tyas & Pangesti, 2018). Strategies for strengthening literacy and numeracy to support independent learning in primary schools (Muliantara & Suarni, 2022). Literacy in improving critical thinking skills in the age of disruption (Rohman, 2022). Analysis of primary school students' literacy skills (Harahap et al., 2022). Strategies for strengthening student literacy and numeracy (Rohim, 2023). Development of contextual oriented assessment to improve students' mathematical literacy and numeracy skills (Jamil & Khusna, 2021). Analysis of students' numeracy literacy ability in solving story problems in view of mathematical initial ability (Takaria et al., 2022). The role of working memory in early literacy and numeracy skills (Shvartsman & Shaul, 2023).

So in simple terms, contextual word problems are also referred to as story problems, which contain relevant problems and are directly related to situations that occur in everyday life. Therefore, using contextual problems in learning will make it easier for students to understand problems related to life situations in their environment. Based on observations at SMK Negeri 4 Klaten, it was found that learning activities were not optimal. This can be seen from the average daily test of students in mathematics material is 67.8 which has not met the KKM passing standard. After further analysis of the daily test results, it was found that students' literacy and numeracy skills varied as seen from the students' ability to solve contextual problems. Based on some of these things, the researchers tried to conduct research with the aim of describing how the numeracy literacy ability of tenth grade students in solving context-based story problems conducted at SMK Negeri 4 Klaten. The description of students' numeracy literacy ability is based on the indicators used by researchers.

The novelty of this research is that no research has been found that discusses the analysis of students' literacy and numeracy skills in solving contextual-based problems at SMK Negeri 4 Klaten. The urgency of this research is that knowing the results of this research is expected to be able to provide input to teachers to be more creative and innovative in helping students improve literacy and numeracy skills in solving contextual-based story problems. Furthermore, the results of this research can be used as a strategy in improving the quality of learning.

Research Method

The type of this research uses descriptive qualitative methods. Descriptive qualitative methods obtain the data results are in the form of written sentences obtained from observations (Margono, 2014). The data results refer to the description of students' numeracy literacy ability in solving problems based on contextual-based story problems based on the indicators of numeracy literacy ability. In this research, the material is a system of linear equations based on indicators of numeracy literacy skills. The indicators are: 1) ability in identifying and understanding of problems, 2) ability in understanding by using symbols and numbers, 3) ability in choosing and applying the method to solve the problem, and 4) ability in concluding the final result of solving the problem (Han et al.,

2017). The subject research determine by using the purposive sampling from the tenth grade students of *Akuntansi dan Keuangan Lembaga (AKL)* in SMK N 4 Klaten.

In carrying out the research, students were given questions in the form of a numeracy literacy test which was done by the students. After obtaining the test results, students classified into three groups based on their level of academic ability, namely the upper, middle, and lower groups. Each level of academic ability taken by two students as research subjects that interviewed in depth regarding students who complete the numeracy ability test. Reference for grouping students' academic abilities described on the following table.

Table 1. Reference for Grouping Students

Category	Interval Value
Upper	$80 \leq n \leq 100$
Middle	$65 \leq n < 80$
Lower	$0 \leq n < 65$

Note: n = Value

Source: Depdiknas (in Rofiki, 2013)

The data collection techniques are documentation, tests, interviews, and documentation. The instrument validation stage uses an expert validation test consisting of two lecturers and one teacher. The aspects assessed were question grids, numeracy literacy test questions, answer keys, scoring guidelines and interview guidelines. The results of the overall literacy and numeracy test instrument validation test results from three validators gave the results of the numeracy literacy test instrument can be used without revision. The results of the interview guideline expert validation test as a whole from three validators gave the results of the interview guidelines can be used without revision. The reliability coefficient range is $0 \leq r_{11} \leq 1$, an instrument is called reliable if $r_{11} \geq 0$, 70 (Budiyono, 2015). Based on testing obtained r_{11} = 0, 858 so that the literacy and numeracy instrument is reliable. The research instruments are test which contained three description questions and interview guide. The data analysis technique is based on the Miles dan Huberman (2007) model, namely data reduction, data display, and drawing conclusions. In the data reduction stage, the researcher collecting and grouping the data on students' numeracy literacy abilities obtained from test results, interviews, and documentation. In the data display stage, the researcher presents the research data in the form of an assessment of the percentage scores of students' numeracy literacy ability in each indicator from the test

results. For assessing the percentage of students' numeracy literacy ability scores use the following formula.

$$X\ (\%) = \frac{\text{The score obtained}}{\text{Score maximum}} \times 100\%$$

According to Arikunto (2010) stated that criteria of numeracy literacy ability served below.

Table 2. Criteria of Numeracy Literacy Ability

Score Percentage (%)	Criteria
$80 \leq X \leq 100$	Very Good
$66 \leq X < 80$	Good
$56 \leq X < 66$	Sufficient
$40 \leq X < 56$	Poor
$0 \leq X < 40$	Very Poor

Note: X = Score Percentage of Numeracy Literacy Ability

According to the description above, the researcher concludes that the entire research data obtained from student test results, interviews, and documentation.

Results and Discussion

Based on the results of the numeracy literacy ability test in class X *Akuntansi dan Keuangan Lembaga (AKL)* 2 with a total 36 students, it found that there are 12 students whose academic abilities are from the upper group, 9 students whose academic abilities are from the middle group and 15 students whose abilities are from lower group. After knowing the categories of students' academic abilities based on the test results, the researcher determined the research subjects to conduct interviews about how the subjects complated the test as many as two students for each category. The list of researcher subjects for interviews is shown in the following table.

Table 3. Subject of Interview

Numb.	Interval Value	Category	Value	Subject of Interview
1	$80 \leq n \leq 100$	Upper	100	S13
2			85.7	S32
3	$65 \leq n < 80$	Middle	66.7	S11
4			76.2	S17
5	$0 \leq n < 65$	Lower	54.8	S18
6			54.8	S36

And the results of data analysis of students' numeracy literacy ability for each group based on indicators of numeracy literacy ability is shown in the following table.

Table 4. Indicator of Numeracy Literacy Ability

Indicator of Numeracy Literacy Ability	Academic Group	Research Subject	Score	Score Percentage	Average of Score	Criteria
Identificating and Understanding of Problem	Upper	S13	12 of 12	100%	100%	Very Good
		S32	12 of 12	100%		
	Middle	S11	6 of 12	50%	50%	Poor
		S17	6 of 12	50%		
	Lower	S18	0 of 12	0%	0%	Very Poor
		S36	0 of 12	0%		
Understanding by Using Symbol and Number	Upper	S13	12 of 12	100%	91.7%	Very Good
		S32	10 of 12	83.3%		
	Middle	S11	10 of 12	83.3%	87.5%	Very Good
		S17	11 of 12	91.7%		
	Lower	S18	11 of 12	91.7%	87.5%	Very Good
		S36	10 of 12	83.3%		
Choosing and Applying the Method to Solve the Problem	Upper	S13	12 of 12	100%	87.5%	Very Good
		S32	9 of 12	75%		
	Middle	S11	9 of 12	75%	79.2%	Good
		S17	10 of 12	83.3%		
	Lower	S18	8 of 12	66.7%	70.8%	Good
		S36	9 of 12	75%		
Concluding the Final Result of Solving the Problem	Upper	S13	6 of 6	100%	91.7%	Very Good
		S32	5 of 6	83.3%		
	Middle	S11	3 of 6	50%	66.7%	Good
		S17	5 of 6	83.3%		
	Lower	S18	4 of 6	66.7%	66.7%	Good

From the data analysis, Table 4 shows that there are differences in the numeracy literacy ability of students from each academic group in solving contextual-based story

problems. Differences in student abilities can also be explored through in-depth interviews with subjects that show how students think in completing their tests. By conducting interviews, it was found that students' made mistakes when solving test questions. The detail of the students' numeracy literacy ability will be discussed in the following discussion.

1. *Students' Numeracy Literacy Ability in Identifying and Understanding the Problem*

   Based on the results of the test data, it was found that in identifying and understanding the problem, students in the upper group had very good criteria (100%), students in the middle group had poor criteria (50%), and students in the lower group had very poor criteria (0%). This means that both upper and middle group students are able to write down what is known and asked about the questions well, even though there are still mistakes in writing the answers.

   From the results of in-depth interviews with the subjects, it was found that each student from the upper, middle, and lower groups was able to state what was known and asked about the questions completely and correctly without any difficulty in understanding the sentences of the questions given, so that the ability to identify and understand problems is met properly. However, because the average score of students in the middle and lower groups is still not optimal, the ability of students to identify and understand problems is also not optimally fulfilled. This is because students from the middle group tend to focus more on how to work on the questions, while students from the lower group do not yet understand how to transform the information about the questions given into known and asked forms and deliberately ignore writing known and asked questions to shorten the time for doing the questions.

2. *Students' Numeracy Literacy Ability in Understanding by Using Symbol and Number*

   Based on the results of the test data, it was found that the students' ability to understanding by using symbol and number from the upper group students was very good (91.7%), while the middle and lower group students also had very good criteria (87.5%). This means that each student is able to make a mathematical model of the equation according to the information from the problem, even though there are still mistakes in writing the answer.

   Based on the results of in-depth interviews with the subjects, it was found that students from the upper, middle, and lower groups were able to explain the mathematical equation models obtained well. However, because the writing of the

answers is still not optimal, the ability of students to understand and use symbols and numbers is also not optimally fulfilled. This is because each student made a mistake in writing the answer. For students from the upper group, they think that the description of the symbols does not need to be written down, and for students from the middle group, they do not understand how the concept of writing examples for symbol descriptions used in the mathematical model of the equation is correct. Students from the lower group made mistakes in writing down their answers due to a lack of accuracy in reading the questions and also in writing down the answers.

3. *Students' Numeracy Literacy Ability in Choosing and Applying the Method to Solve the Problem*

Based on the results of the test data, it was found that the students' ability to choosing and applying the method to solve the problem from the upper group had very good criteria (87.5%), from the middle group had good criteria (79.2%), and from the lower group had good criteria (70.8%). This means that each student is able to write down the problem-solving for each question properly even if there are errors in the answer.

From the results of in-depth interviews with the subject, it was found that both the upper, middle, and lower group students were able to choose and apply problem-solving methods well, even though there were a few errors in writing them, so that the ability to choose and apply problem-solving methods was not optimally fulfilled. This is due to errors made by students. Students from the upper group made a few mistakes due to their lack of accuracy in writing down their answers. Whereas students from the middle and lower groups both made a few mistakes in writing their answers because both of them had not been able to manage the time to work on the questions properly and because of the students' lack of accuracy in writing answers and when doing calculations. This resulted in the process of solving the problem of questions that have not been answered optimally.

4. *Students' Numeracy Literacy Ability in Concluding the Final Result of Solving the Problem*

Based on the results of the test data, it was found that students' ability to concluding the final result of solving the problem from the upper group had very good criteria (91.7%), while both students from the middle and lower groups had good criteria (66.7%). This means that each student draws a conclusion from the final result

of solving the problem well, even though there are a few mistakes, so that the student's ability to draw and explain conclusions from the final result of solving the problem is still not optimally fulfilled.

From the results of in-depth interviews with the subjects, it was found that students from upper, middle, and lower group were able to draw conclusions from the final results of the completion, which were well obtained even though students made mistakes in writing their answers. For mistakes made by students from the upper group due to a lack of ability to manage the time to work on the questions properly. errors made by students in the middle group due to a lack of understanding by students in writing conclusions on solving the correct questions, incomplete answers written by students to answer questions, and a lack of accuracy when doing calculations. Whereas the mistakes made by students from the lower group were caused by the lack of accuracy of students in writing answers and when doing calculations, and the lack of accuracy of students in reading questions, which made the mathematical equation model written by students not in accordance with the information from the questions given.

The results of this study are in line with other relevant research (Pulungan, 2022), (Takaria et al., 2022), (Mahmud, M. R. dan Pratiwi, 2019), (Indra & Rahadyan, 2021), (Yustinaningrum, 2021), where the research similarities refer to students' numeracy literacy skills in solving mathematical story problems while the difference in research is in the location of students' difficulties and errors in solving story problems.

Conclusion and Suggestion

Based on the results of the research and discussion, it is found that students' numeracy literacy skills consist of the ability to identify and understand problems, the ability to understand and use symbols and number, and the ability to choose and apply problem-solving methods. Overall, students have been able to fulfill each indicator of literacy and numeracy skills. In solving contextual-based word problems, students made several mistakes due to students' lack of accuracy and thoroughness both in reading the questions, writing answers and the calculation process.

References

Agustina, E., & Moh Zayyad. (2023). Kemampuan literasi numerasi siswa di sekolah inklusi. *Jurnal Program Studi Pendidikan Matematika*, *9*(1).

Arikunto, S. (2010). *Prosedur Pennelitian: Suatu Pendekatan Praktik*. Rineka Cipta.

Budiyono. (2015). *Pengantar Penilaian Hasil Belajar*. UNS Press.

Dantes, N., & Handayani, N. N. L. (2021). Peningkatan Literasi Sekolah Dan Literasi Numerasi Melalui Model Blanded Learning Pada Siswa Kelas V SD Kota Singaraja. *WIDYALAYA: Jurnal Ilmu Pendidikan*, *1*(3).

Han, W., Susanto, D., Dewayani, S., Pandora, P., Hanifah, N., Miftahussururi, Nento, M. N., & Akbari, Q. S. (2017). *Materi Pendukung Literasi Numerasi*. Kementerian Pendidikan dan Kebudayaan.

Harahap, D. G. S., Nasution, F., Nst, E. S., & Sormin, S. A. (2022). Analisis Kemampuan Literasi Siswa Sekolah Dasar. *Jurnal Basicedu*, *6*(2). https://doi.org/10.31004/basicedu.v6i2.2400

Indra, K., & Rahadyan, A. (2021). Analisis Kemampuan Numerasi Siswa Kelas XI dalam Penyelesaian Soal Tipe AKM pada Pokok Bahasan Sistem Persamaan Linear Tiga Variabel. *Didactical Mathematics*, *3*(2). https://doi.org/10.31949/dm.v3i2.1810

Jamil, A. F., & Khusna, A. H. (2021). Pengembankan Asesmen Berorientasi Kontekstual Untuk Meningkatkan Kemampuan Literasi Matematis Dan Numerasi Mahasiswa. *Jurnal Ilmiah Mandala Education*, *7*(4). https://doi.org/10.36312/jime.v7i4.2385

Larasaty, B. M., Mustiani dan Pratini, H. S. (2018). Peningkatan Kemampuan Literasi Matematika Siswa Kelas VIII SMP BOPKRI 3 Yogyakarta Melalui Pendekatan PMRI Berbasis PISA pada Materi Pokok SPLDV. *Prosiding Seminar Nasional Etnomatnesia*, 622–633.

Mahmud, M. R. dan Pratiwi, I. M. (2019). Literasi Numerasi Siswa dalam Pemecahan Masalah Tidak Terstruktur. *KALAMATIKA Jurnal Pendidikan Matematika*, *4*(1), 69–88.

Margono, S. (2014). *Metode Penelitian Pendidikan*. Rineka Cipta.

Miles, M. B. dan Huberman, A. (2007). *Analisis Data Kualitatif Buku Sumber Tentang Metode-Metode Baru*. Universitas Indonesia.

Muliantara, I. K., & Suarni, N. K. (2022). Strategi Menguatkan Literasi dan Numerasi untuk Mendukung Merdeka Belajar di Sekolah Dasar. *EDUKATIF : JURNAL ILMU PENDIDIKAN*, *4*(3). https://doi.org/10.31004/edukatif.v4i3.2847

Pratiwi, I. M., Apriani, L. dan Pratama, R. A. (2020). Supporting The Numeracy Literacy Skill Of Elementary School Students. *Jurnal Pengajaran MIPA*, *25*(2).

Pulungan, S. A. (2022). Analisis Kemampuan Literasi Numerasi pada Materi Persamaan Linear Siswa SMP PAB 2 Helvetia. *Journal On Teacher Education*, *3*(3), 266–274.

Puspaningtyas, N. D., & Ulfa, M. (2021). Pelatihan Soal Matematika Berbasis Literasi Numerasi pada Siswa SMA IT Fitrah Insani. *Jurnal Pengabdian Masyarakat MIPA Dan Pendidikan MIPA*, *4*(2). https://doi.org/10.21831/jpmmp.v4i2.37504

Rahmadeni, F., Septiana, A., & Syaripah, S. (2023). Numeracy Literacy Module Based on Local Culture: Effort to Improve Numeracy Literacy Skill. *Al Khawarizmi: Jurnal Pendidikan Dan Pembelajaran Matematika*, *7*(1). https://doi.org/10.22373/jppm.v7i1.17115

Rofiki, I. (2013). Profil Pemecahan Masalah Geometri Siswa Kelas Akselerasi SMP Negeri 1 Surabaya Ditinjau dari Tingkat Kemampuan Matematika. *Prosiding Seminar Nasional Matematika Dan Aplikasinya 2013*, *1*, 300–310.

Rohim, D. C. (2023). Strategi Penguatan Literasi dan Numerasi Siswa di SD N Jatiroto 01 Kabupaten Pati. *Jurnal Elementary*, *6*(1).

https://doi.org/10.31764/elementary.v6i1.12579

Rohman, A. (2022). Literasi dalam Meningkatkan Kemampuan Berpikir Kritis di Era Disrupsi. *EUNOIA (Jurnal Pendidikan Bahasa Indonesia)*, *2*(1). https://doi.org/10.30821/eunoia.v2i1.1318

Shvartsman, M., & Shaul, S. (2023). The Role of Working Memory in Early Literacy and Numeracy Skills in Kindergarten and First Grade. *Children*, *10*(8). https://doi.org/10.3390/children10081285

Takaria, J., Pattimukay, N., & Kaary, K. M. (2022). Analisis Kemampuan Literasi Numerasi Siswa Dalam Menyelesaikan Soal Cerita Ditinjau Dari Kemampuan Awal Matematis (KAM). *PEDAGOGIKA: Jurnal Pedagogik Dan Dinamika Pendidikan*, *10*(2). https://doi.org/10.30598/pedagogikavol10issue2page318-327

Tyas, F., & Pangesti, P. (2018). Menumbuhkembangkan Literasi Numerasi Pada Pembelajaran Matematika Dengan Soal Hots [Growing Numerical Literacy in Mathematics Learning With Hots Problems]. *Indonesian Digital Journal of Mathematics and Education*, *5*(9).

Utami, A. J. L. dan Zulkarnaen, R. (2019). Analisis Kesalahan Siswa Kelas XI Dalam Menyelesaikan Soal Cerita Pada Materi Sistem Persamaa Linear Tiga Variabel (SPLTV). *Prosiding Seminar Nasional Matematika Dan Pendidikan Matematika Sesiomadika 2019*, 448–458.

Yustinaningrum, B. (2021). Deskripsi Kemampuan Literasi Numerasi Siswa. *Jurnal Sinektik*, *4*(2).