

Numerical Literacy Skill of Vocational High School Students in Solving HOTS Problems

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ABSTRACT

This study aims to describe a numeracy literacy skill of Vocational High School (SMK) students for solving High Order Thinking Skills (HOTS) problems. The type of research used is descriptive qualitative research. Sampling was done by purposive sampling technique. This research was conducted at SMK Komputama Jeruklegi in XI TKJ 1. Data collection used a numeracy literacy test and interview guidelines. The results showed that students answered correctly on indicator 1 of numeracy literacy by 37.7%; indicator 2 of 31.9%; and indicator 3 of 27.2%. If viewed based on the percentage of each category of HOTS questions, the correct answer in the C4 category is 33.9%; category C5 by 28.3%; and category C6 by 32.6%. The answers from 23 students in solving numeracy literacy questions are that students are less able to use various kinds of numbers and symbols to solve problems, students have not been able to analyze the information displayed in various forms of data presentation, and have difficulty in interpreting the results. Students also have more difficulty when working on questions with the HOTS category, even starting from the analyzing category (C4). Based on these results, it shows that students' numeracy literacy skills are still low in solving questions in the HOTS category. The results of the research can be used as a reference for teachers and schools to implement more effective and innovative learning so as to improve students' skills in solving problems with higher-order thinking categories. In addition, it can also be used as a consideration for teachers and students in implementing learning that can foster students' numeracy literacy skills.

Keywords: HOTS, Numerical Literacy, Solving Problems.

ABSTRAK

Penelitian ini bertujuan untuk mendeskripsikan kemampuan literasi numerasi siswa Sekolah Menengah Kejuruan (SMK) dalam menyelesaikan soal High Order Thinking Skills (HOTS). Jenis penelitian yang digunakan adalah penelitian deskriptif kualitatif. Pengambilan sampel dilakukan dengan teknik purposive sampling. Penelitian ini dilakukan di SMK Komputama Jeruklegi pada kelas XI TKJ 1. Pengumpulan data menggunakan tes literasi numerasi dan pedoman wawancara. Hasil penelitian menunjukkan bahwa siswa menjawab benar pada indikator 1 literasi numerasi sebesar 37,7%; indikator 2 sebesar 31,9%; dan indikator 3 sebesar 27,2%. Jika dilihat berdasarkan persentase tiap kategori soal HOTS maka jawaban benar pada kategori C4 (analyze) sebesar 33,9%; kategori C5 (evaluate) sebesar 28,3%; dan kategori C6 (create) sebesar 32,6%. Jawaban dari 23 siswa dalam menyelesaikan soal literasi numerasi yaitu siswa kurang dapat menggunakan berbagai macam angka dan simbol untuk menyelesaikan masalah, siswa belum dapat menganalisis informasi yang ditampilkan dalam berbagai bentuk penyajian data, serta kesulitan dalam menafsirkan hasilnya. Siswa juga bertambah kesulitannya ketika mengerjakan soal dengan kategori HOTS bahkan mulai dari kategori menganalisis (C4). Berdasarkan hasil tersebut menunjukkan kemampuan literasi numerasi siswa masih rendah dalam menyelesaikan soal dengan kategori HOTS. Hasil dari penelitian dapat digunakan sebagai acuan bagi guru dan sekolah untuk menerapkan pembelajaran yang lebih efektif dan inovatif sehingga dapat meningkatkan ketrampilan siswa dalam menyelesaikan soal dengan kategori berpikir tingkat tinggi. Selain itu juga dapat digunakan sebagai pertimbangan guru dan siswa dalam menerapkan pembelajaran yang dapat menumbuhkan kemampuan literasi numerasi siswa.

Kata kunci: HOTS, Literasi Numerasi, Menyelesaikan Soal.

Received	: July 4, 2022	/Revised	: November 9, 2022
/Accepted	: November 11, 2022	/ Published	: November 30, 2022

Introduction

The Minimum Competency Assessment (Asesmen Kompetensi Minimum/ AKM) is an assessment of the basic competencies needed by all students to be able to develop their own capacity and participate positively in society (Mendikbud, 2020). AKM measures two competencies including reading literacy and mathematical literacy (numbering). Competencies assessed in both reading literacy and numeracy literacy include logical-systematic thinking

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skills, reasoning skills using concepts and knowledge that have been learned, as well as problems with various contexts that are expected to be solved by students.

Mathematics subjects can be related to students' numeracy literacy skills. Numeration is the ability to think using concepts, procedures, facts, and mathematical tools to solve everyday problems in various types of contexts that are relevant for individuals as citizens of Indonesia and the world (Mendikbud, 2020). Numeracy ability according to Cockroft (Goos et al., 2011) is an expertise in solving practical problems using numbers. Numerical literacy is the knowledge and skill to (a) use various kinds of numbers and symbols related to basic mathematics to solve practical problems in various contexts of everyday life, (b) analyze information presented in various forms (graphs, tables, charts, etc.), (c) use the interpretation of the results of the analysis to predict and make decisions (Han et al., 2017). Based on the explanation from the GLN Team (National Literacy Movement), this definition will be used as an indicator of numeracy literacy in this study.

Numerical content (Han et al., 2017) is divided into four groups, namely number, measurement and geometry, data and uncertainty, and algebra. Context indicates the aspect of life or situation for the content used. The context of AKM is divided into three, namely personal, socio-cultural, and scientific.

In the senior secondary or vocational education unit, the National Assessment (Asesmen Nasional/ AN) is attended by class XI students who are randomly selected by the Ministry of Education and Culture. The purpose of the assessment is to develop student's competence and character. Assessment in the form of literacy and numeracy is actually not something new in the world of education, but its implementation in schools is still not optimal so that it still feels foreign to some students, including Vocational High School students.

Vocational High School students prioritize skills in the area of expertise they take so that sometimes they ignore the importance of literacy. This is evident from the results of interviews with several students in one of the vocational schools, namely SMK Komputama Jeruklegi. They have the view that after graduating they will immediately work and skills in the field or major they take that they feel will be used in everyday life. Whereas Lamada et al (Puspaningtyas & Ulfa, 2020) state that literacy development is important to note, because literacy is an initial ability that must be possessed by every individual to live life in the future. However, the current conditions are various problems that arise in learning mathematics such as the gap in the numeracy skills of different students (Suciyati et al., 2022).

Recently the assessment has been carried out in several schools. Experiences and challenges must be obtained by students who participate in these activities. The numeracy literacy questions they work on require reasoning and problem-solving skills to solve. This is in accordance with the statement that mathematical problem solving and numeracy literacy are closely related (Pangesti, 2018). Numerical literacy requires knowledge of mathematics that is learned in the school curriculum. However, school mathematics learning may not necessarily be able to develop numeracy skills if the material taught to students is not designed to develop numeracy literacy skills. Pangesti said that problems with characteristics to stimulate human cognition in exploring mathematical ideas, strengthening reasoning relationships between mathematical concepts, and exercising creativity in finding problem-solving strategies can be found in Higher Order Thinking Skills (HOTS) questions. HOTS are higher order thinking skills that are part of Bloom's revised taxonomy. High-level thinking skills, including the ability

to solve problems, critical thinking, creative thinking, reasoning, and decision making. In Bloom's Taxonomy requires the ability to analyze (C4), evaluating (C5), and create (C6) (Widana, 2017).

The characteristics HOTS assessment (Widana, 2019) are (1) measuring the ability of a high level; (2) based on contextual issues; and (3) not routine (not familiar). HOTS makes students able to understand a concept, make lessons more meaningful, be able to distinguish ideas clearly, can argue well, be able to understand complex things and solve them. Therefore, students can be invited to think actively, especially in solving problems (Arifin & Ratu, 2018).

HOTS questions are important given to students. However, in reality students think that the HOTS questions are difficult to solve. Even though HOTS questions don't have to be difficult, and difficult questions are not necessarily HOTS questions (Sani, 2021). Difficult questions that are usually trained in schools cannot be said to be HOTS questions because students already know how to solve them. However, simple questions that require reasoning can be categorized as HOTS questions. The difficulties that students usually experience can be because they rarely get HOTS questions during class learning. Most of the questions encountered in learning are only questions at the LOTS (Lower Order Thinking Skills) level which measure abilities (Wilson, 2016) including remember (C1), understand (C2) and apply (C3). Students are only used to working on questions that test their memorization, directly using formulas, or giving explanations of what the teacher has taught. Students also feel that mathematics is only about the ability to count and do not realize that mathematics can be applied in their daily lives.

Research related to HOTS has been conducted (Arifin & Ratu, 2018) on three students who have high, medium, and low mathematical abilities. The result is that students with high abilities are able to reach the analysis and evaluation stage, but are not able to create the stage. Students with moderate abilities can only reach the analysis stage and students with low abilities cannot reach all three stages. In addition, another study (Oemolos & Ratu, 2020) writes that students with high math skills can reach all three stages of HOTS, while students with medium and low abilities have not been able to reach the stages of analysis, evaluation, and creation.

Contextual questions can make it easier for students to understand mathematical problems. Giving questions will help students use literacy skills in answering questions, and can challenge students' mathematical thinking patterns (Putra et al., 2016). Therefore, teachers need to familiarize and train students in solving problems with high-level categories that require analytical, evaluation, and creative skills to solve them. Based on the problems, the researchers will examine the numeracy literacy skills of vocational high school students in solving HOTS problems.

Research Methods

Implementation of research at SMK Komputama Jeruklegi for academic year 2021/2022. The research subjects were students of XI TKJ 1 SMK Komputama Jeruklegi a total of 23 students. This type of research is descriptive qualitative. This study aims to describe the numeracy literacy skills of Vocational High School students in solving High Order Thinking Skills (HOTS) problems. The instruments used are tests and interviews. The test was conducted to obtain data on students' abilities in solving HOTS type numeracy literacy questions. The test is carried out for 60 minutes with 13 questions. Based on the test results, together with the mathematics teacher, a discussion was held to determine the subjects that could be interviewed. The interview aims to strengthen the data on students' numeracy literacy skills in solving HOTS

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type questions. The data analysis technique was carried out descriptively, namely describing the results of tests and interviews from students.

Result and Discussions

The following are the results of the numerical ability analysis of 23 students who worked on 13 questions. The results of the correct answers from 23 students can be seen in Figure 1 below.



Of the 23 students who took the numeracy ability test, a total of 21 students answered correctly 1 to 6 questions, while only 2 students answered correctly more than 6 questions. This shows that 91.3% of students have numeracy skills which are included in the low criteria because almost all students cannot do half of the questions given. The low number of correct answers to the questions that the students did indicates that students are still weak in using various numbers or symbols to solve problems; students are weak in analyzing the form of data presentation; and the lack of students' ability to predict and make decisions.

In more detail, numeracy skills can be identified from 3 indicators of numeracy ability (Han et al., 2017), namely (1) Using various kinds of numbers and symbols related to basic mathematics to solve problems in various contexts of everyday life, (2) Analyze the information displayed in various forms (graphs, tables, charts, diagrams, and so on), (3) Interpret the results of the analysis to predict and make decisions. The results of the three indicators of numeracy ability can be seen in Table 1 below.

Т	Table 1. Numerical Indicators and Correct Answ	vers for Eac	ch Questio	n	
Number	Numerical indicator	Question	Number of Answers		
		Nulliber	Correct	Incorrect	
1	Use a variety of numbers and symbols related	2	7	16	
	to basic mathematics to solve problems in a	4	2	21	
	variety contexts of everyday life	10	17	6	
2	Analyze information displayed in various	5	9	14	
	forms (graphs, tables, charts, diagrams, and	8	7	16	
	so on)	9	4	19	
		11	2	21	
		12	8	15	
		13	14	9	

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3	Interpret the results of the analysis to predict	1	4	19
	and make decisions	3	5	18
		6	8	15
		7	8	15

Based on Table 2, it can be seen that the first numeracy indicator consists of three questions, namely questions number: 2, 4, and 10. The percentage of students who answered correctly on question number 2 was 30.4%, question number 4 was 8.7%, and question number 10 of 73.9%. Of the three questions tested, only question number 10 gave the correct answer more than 50%, besides that the other two questions received a percentage that was still less than 50%.

The second numeration indicator consists of six questions, namely questions number: 5, 8, 9, 11, 12, and 13. The percentage of students who answered correctly on question number 5 was 39.1%, question number 8 was 30.4%, question number 9 by 17.4%, question number 11 by 8.7%, question number 12 by 34.8%, and question number 13 by 60.9%. Of the six questions on indicator two, only question number 13 can be answered correctly by more than 50% of the students, while the other five questions have a correct percentage of less than 50%.

The third numeration indicator consists of four questions, namely questions number: 1, 3, 6, and 7. The percentage of students who answered correctly on question number 1 was 17.4%, question number 3 was 21.7%, and questions numbered 6 and 7 were 34. ,8%. So, in the third indicator there is no single number with the percentage of students who answered correctly more than 50%. If the answers to the numeration test are mapped based on the number of true and false on the three indicators, the following image is obtained.



Based on indicator 1, which is using various numbers or symbols related to basic mathematics to solve problems, 37.7% of students answered correctly. Indicator 2, which is analyzing the information presented in various forms, shows that 31.9% of students answered correctly. Finally, indicator 3, which is using the interpretation of the results of the analysis to predict and make decisions, shows that 27.2% of students answered correctly. The order of indicators with more students who answered correctly was indicator 1 with 37.7%, indicator 2 with 31.9%, and indicator 3 with 27.2%. However, there are no indicators that show students can answer more than half of the questions given. This means that the three indicators cannot be mastered by students even though only fifty percent of the answers are correct.

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The answers from 23 students in answering numeracy literacy questions showed that students were still unable to use various kinds of numbers or symbols related to mathematics, analyze information displayed in various forms of data presentation, and the biggest difficulty was questions related to interpreting the results of the analysis. Therefore, it can be concluded that students have difficulty in solving questions that contain the three indicators of numeracy literacy.

HOTS type questions in Bloom's taxonomy consist of analyze (C4), evaluate (C5), and create (C6). The explanation of the three cognitive domains (Utari & Madya, 2011) are: a) analyze means the ability to separate concepts into several components and connect them to each other to gain an understanding of the concept as a whole; b) evaluate means the ability to determine the degree of something based on certain norms, criteria or benchmarks; c) create means the ability to combine elements into a new form that is complete and coherent, or to create something original.

The three cognitive domains are divided into several questions. The following is the grouping of question numbers with cognitive domains in Bloom's taxonomy.

	Table 2. Grou	ping of Cognitive Do	mains
Number	Cognitive domain	Question number	Number of questions
1	Analyze (C4)	1, 7, 10, 11, 12	5
2	<i>Evaluate</i> (C5)	2, 6, 8, 9	4
3	Create (C6)	3, 4, 5, 13	4

Based on table 2 there are 5 questions with categories C4, 4 questions with categories C5 and C6. The three categories show different numbers of right and wrong answers. The results of right and wrong answers for each category in the cognitive domain are shown in the image below.



Category C4 shows that only on question number 10 more students answered correctly than incorrectly (Figure 3). In addition, the other four questions in this category had more students who answered incorrectly. Furthermore, the four questions in the C5 category showed more students who answered incorrectly (Figure 4). Category C6 shows only question number 13 which shows more students who answered correctly (Figure 5).

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If made in percentage form for each category, the correct answer in category C4 is 33.9%; category C5 is 28.3%; and category C6 is 32.6%. The order of the percentage of correct answers from the largest is C4 which tests students in terms of analysis, C6 which measures students in creating, and C5 which tests students so that they can evaluate based on criteria or benchmarks. However, all categories showed low results.

The low numeracy literacy skills of students in solving HOTS questions on the subjects studied have been described above. However, it is necessary to investigate further regarding this low ability. Interviews were conducted with three students according to discussions with subject teachers and according to the results of the numeracy literacy test. The results of the interview are as follows.

The DFS subject said that the difficulty in working on numeracy literacy questions with the HOTS type was in analyzing the information presented in charts, tables, or pictures. The DFS student gave an example in question number 8 he was tricked into answering directly by looking at the data in the table without analyzing the given stimulus (Figure 6). On another question, he also found it difficult to make a decision after doing the analysis.

3. Doluang Brazil untuk menjadi petuang juara dun	9
adalah I. Karena menurut tahel preditor babak Petempat Firial plata duria 2018 Brazil memiliki	1
total peluano 1.	-
Figure 6. Student's answer number 8	

Brazil's chance to become world champion is 1. Because according to the prediction table for the 2018 world cup quarter-finals, Brazil has a total chance of 1.

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The second subject, SR said that he was not careful in reading the stimulus so that there were errors in symbolizing and mathematical calculations. The subject of SR added that there were several questions related to everyday problems that he could not relate to mathematics, especially when the questions required him to arrange numbers. However, in working on numeracy literacy questions, SR subjects can answer question number 3 and solve it by reasoning and logic (Figure 7). Students' answers to question number 3 are as follows (the questions are taken and modified from the HOTS module).



Finally, the RMT subject said that he could only answer questions that he could relate to the subject matter he remembered at school. Long questions make it difficult for RMT students to use and analyze information. He gave an example of question number 13 that he did not know there was a relationship between reading (stimulus) and his question. Then in question number 3, RMT students cannot arrange or plan the process, so it is difficult to draw conclusions even though the questions have been assisted with pictures.

Based on the answers of the three subjects interviewed, the difficulty of students in almost all numeracy indicators. If you look at the cognitive domain in Bloom's taxonomy, there are even students who have difficulty starting from analysis, meaning that students have problems starting to work on questions in the C4 category. Even so, the low literacy skills of students can also be caused by various factors. Factors that can influence include: the material chosen, the learning provided by the teacher, the classroom environment, support from the family environment, readiness in carrying out tests and the abilities of each student themselves (Khoirudin et al., 2017). In addition, research (Anderha et al., 2021) concludes that if students' numeracy skills are high, the learning achievement that will be obtained will also be high, and vice versa. This means that student achievement also contributes to the level of students' numeracy skills. Therefore, the low literacy skills of students in class XI TKJ 1, the factors that cause them difficulty in solving the questions include students' readiness in carrying out tests, forms of test questions that are rarely obtained by students, and lack of accuracy in doing.

Conclusion

Based on the results of the research and discussion, it can be concluded that the numeracy literacy ability of XI TKJ 1 SMK Komputama Jeruklegi students in solving High Order Thinking Skills (HOTS) questions is still low. Students' correct answers on indicator 1 of numeracy literacy are 37.7%; indicator 2 is 31.9%; and indicator 3 is 27.2%. That is, the three indicators are less than fifty percent so that students still cannot master all indicators of numeracy literacy. If viewed based on the percentage of each category of HOTS questions, the correct answer in category C4 (analyze) is 33.9%; category C5 (evaluate) is 28.3%; and category C6 (create) is 32.6%. The answers from 23 students of class XI TKJ 1 in solving numeracy literacy questions are that students are less able to use various kinds of numbers and symbols to solve problems, students have not been able to analyze the information displayed in various forms of data presentation, and have difficulty in interpreting the results. Students also have more difficulty when working on questions with the HOTS category, even starting from the analyzing category (C4). Based on these results, it shows that students' numeracy literacy skills are still low in solving questions in the HOTS category. However, the low numeracy literacy ability of students in solving HOTS questions can occur due to several factors, including student readiness in carrying out tests, forms of test questions that are rarely obtained by students, such as complex multiple choice, questions that contain stimuli that still feel foreign to students, and lack of accuracy in teaching.

Acknowledgment

The researcher would like to thank the Head of the Department of Mathematics Education at the University Muhammadiyah Purwokerto and the Principal of SMK Komputama Jeruklegi who have supported this research.

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