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# Analysis Of Students' Cognitive Process Through Minimum Competency Assessment Mathematics Question in Grade $8^{th}$ in Junior High School

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**ABSTRACT**

This study aims to analyze students' cognitive processes through minimum competency assessment questions. This study uses a qualitative research approach with a descriptive method to describe the mental process of students using minimum competency assessment questions that are carried out at the beginning of learning. The results showed that 13 out of 22 students could use previous knowledge and explain how they used it to understand the text, 21 could identify important and relevant ideas, and as many as 9 students were able to make realistic inferences and cite supporting evidence. Most students cannot yet think mathematically and can solve the given problems. This study also found that as many as 19 students were able to define all vocabulary and be able to explain it. Eighteen participants could not understand the multimodal text, and showed that 11 students were quite able to show how to understand the text even though it was incomplete. Teachers can use this data for initial data as a reference for implementing learning strategies for future teaching.

Keywords: Cognitive Process, Numeracy Literacy, Mathematics Learning

**ABSTRAK**

*Tujuan dari penelitian ini adalah untuk menganalisis proses kognitif siswa melalui soal asesment kompetensi minimum. Penelitian ini menggunakan pendekatan penelitian kualitatif dengan metode deskriptif untuk mendeskripsikan proses kognitif siswa dengan menggunakan soal asesment kompetensi minimum yang dilaksanakan diawal pembelajaran. Hasil penelitian menunjukkan bahwa 13 dari 22 peserta didik sudah memiliki kemampuan untuk menggunakan pengetahuan sebelumnya dan mampu menjelaskan bagaimana dia menggunakannya untuk memahami teks, 21 peserta didik memiliki kemampuan untuk mengidentifikasi ide-ide yang penting dan relevan, Sebanyak 9 orang peserta didik mampu membuat inferensi yang realistis dan menyebutkan bukti pendukung. Mayoritas peserta didik tidak dapat belum mampu berpikir matematis dan mampu menyelesaikan masalah yang diberikan., penelitian ini juga menemukan bahwa Sebanyak 19 orang Peserta didik mampu mendefinisikan semua kosakata dan dapat menjelaskannya. 18 orang peserta belum mampu memahami teks multimoda, serta menunjukkan bahwa 11 orang peserta didik cukup mampu menunjukkan caranya memahami teks meski kurang lengkap. Guru dapat menggunakan data ini untuk data awal sebagai acuan penerapan strategi pembelajaran untuk mengajar selanjutnya.*

*Kata Kunci: Proses kognitif, literasi numerasi, pembelajaran matematika*

## INTRODUCTION

Mathematics is often considered difficult by students due to a lack of understanding of concepts and utilization of learning, such as difficulties in the process of formulating problems, interpreting the context of real situations into mathematical models, and understanding mathematical structures with relationships or patterns in problems (Lestari & Effendi, 2022; Mazana

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et al., 2019; Syawahid, 2019). To address the above, literacy in mathematics is needed to understand and solve problems that occur to students when learning mathematics. Mathematical literacy is one of the high-level skills. This is based on the primary studies of PISA, namely reading literacy, scientific literacy, and mathematics literacy. With the demands of modern times like this, students must have high mathematical literacy skills to compete with other countries. Assessment activities are usually carried out to determine students' abilities (Resti et al., 2020). Evaluation of learning is an inseparable part of a student's educational process. The success of educational goals also cannot be measured by specific evaluations; therefore, the right measuring tools are needed to achieve them (Rohim et al., 2021).

Assessment is an activity to reveal the quality of the learning process (Resti et al., 2020; Widodo et al., 2021). So, it can be said that assessment is the application of assessment tools to get as much information about student success in mastering specific competencies. The National Assessment includes three aspects: the Minimum Competency Assessment (MCA), the character survey, and the learning environment survey (Novita et al., 2021). A minimum competency assessment is used to measure students' cognitive abilities, and the aspects measured are reading literacy and numeracy literacy. The aim is to improve reasoning skills using literacy numeracy and strengthen character education (Megawati & Sutarto, 2021; Novita et al., 2021; Purnomo et al., 2022). However, the results of the minimum competency assessment are not a measure of the success of each individual because the minimum competency assessment captures and maps the quality of schools and education as a whole (Yamtinah et al., 2022). The Minister of Education and Culture said that the minimum competency assessment is a truly minimum competency where we can map schools and regions based on minimum competencies (Megawati & Sutarto, 2021). This is the minimum competency of the essential competencies that students need to be able to learn whatever the material and subject is minimum competency assessment is an assessment of the fundamental competencies required by all students to develop their capacity and participate positively in society (Safari, 2020). The skills in question include critical thinking, problem-solving, creative thinking, communication, and collaboration (Andiani et al., 2020; Utami, 2024).

Minimum competency assessment presents problems with various contexts that learners must solve using their reading literacy and numeracy competencies (Nurhayati et al., 2023). Minimum assessment measures competencies in depth, not just content mastery (Ayuningtyas & Setiyarini, 2023). Minimum competency assessment assesses the fundamental competencies required by all learners to develop their capacity and participate positively in society (Lestari, 2022; Teresia, 2021). According to Kusaeri (2020), numeracy skills include mathematical reasoning and the ability to use mathematical concepts, procedures, and facts in mathematics to describe, explain, and predict a phenomenon. Thus, students need both math and numeracy skills. Numeracy is more directed towards logic and quantitative skills (Anwar et al., 2021). Meanwhile, literacy is the ability to understand reading concepts, which can be seen through the ability of students to reason and analyze the surrounding situation (Kusaeri, 2020). The importance of each individual having literacy and numeracy skills is essential, so the government is now making a policy regarding minimum competency assessment based on literacy and numeracy.

Minimum competency assessment presents problems with various contexts that are expected to be solved by students using their reading and numeracy literacy competencies (Agustina et al., 2022; Kuswidi, 2015). The minimum competency assessment is intended to measure competence in depth, not just mastery of content (Purnomo et al., 2022). The minimum competency assessment is essential for all students to develop their capacity and participate positively in society (Teresia, 2021). Numeracy skills include mathematical reasoning and the ability to use mathematical concepts, procedures, and facts in mathematics to describe, explain, and predict a phenomenon (Rakhmawati & Mustadi, 2022). Thus, students need both, namely mathematical and numeracy skills. Numeracy is more directed to logical and quantitative skills. Numeracy ability can be interpreted as a person's ability to formulate, apply, and interpret mathematics in various contexts, including the ability to reason systematically and use concepts, procedures, and facts to describe, explain, or estimate phenomena/events (Ekowati et al., 2019). One of the things that refers to is the ability of individuals to formulate, use, and interpret mathematics in a suitable context (Wulandari & Azka, 2018). This suggests that numeracy is not only to carry out procedures in solving mathematical problems but also utilizes mathematics in daily life, such as in literacy, which has the meaning (literacy) of mathematics (Rakhmawati & Mustadi, 2022). Meanwhile, literacy is understanding reading concepts through students' ability to reason and analyze the surrounding situation (Kusaeri, 2020).

The minimum competency assessment requires students to use various cognitive skills in answering questions (Wijaya & Dewayani, 2021). The minimum competency assessment is based on literacy and numeracy; students must possess several cognitive processes. Based on Bloom's Taxonomy, the cognitive processes in literacy and numeracy are mainly at the level of middle-order thinking skills and high-order thinking skills (Ariyanto et al., 2020). The cognitive processes that students must master include literacy and numeracy (Apipatunnisa et al., 2022). The cognitive process in literacy skills, namely: (1) Finding information, searching, accessing, and finding explicit information from discourse. (2) Interpretation and integration, understanding explicit and implicit information, combining interpretations between text parts to produce inference. (3) Evaluation and reflection, assessing the credibility, appropriateness, and reliability of the text and being able to relate the content of the text to other things outside the text. Meanwhile, the cognitive processes in numeracy are (1) Comprehension, understanding facts, procedures, and mathematical tools. (2) Application: applying mathematical concepts in fundamental and routine situations. (3) Reasoning, reasoning with mathematical concepts to solve non-routine problems. The numeracy content in minimum competency assessment consists of numbers, geometry of measurement data, algebra, data, and uncertainty (Sutama et al., 2022). The minimum competency assessment requires students to use various cognitive skills in answering questions (Wijaya & Dewayani, 2021)

Numeracy skills through cognitive processes must be improved by requiring a learning model that provides the broadest possible opportunity for students to express their mathematical ideas, develop their thinking skills, and be allowed to develop the problems given (Novianti, 2021). So that students can try to solve the problem and create it themselves (Mansur, 2018). If teachers can know students' cognitive processes when solving minimum competency assessment problems,

then teachers can acquire students' cognitive process abilities. Thus, teachers can plan and implement learning strategies for future learning (Wijaya & Dewayani, 2021). Therefore, this study uses the minimum competency assessment question model to analyze students' cognitive processability, especially in mathematics subjects with linear function material.

## METHOD

This type of research uses a qualitative approach because, in this study, what is produced is in the form of test result data from students who are used as research subjects and can be trusted. Then, the data was interpreted using a descriptive method to describe the cognitive process ability of students in solving minimum competency assessment questions. This research was conducted at one of the State Junior High Schools in Cirebon City, West Java. The subjects of this study were class VIII in the 2023/2024 school year, totaling 22 students.

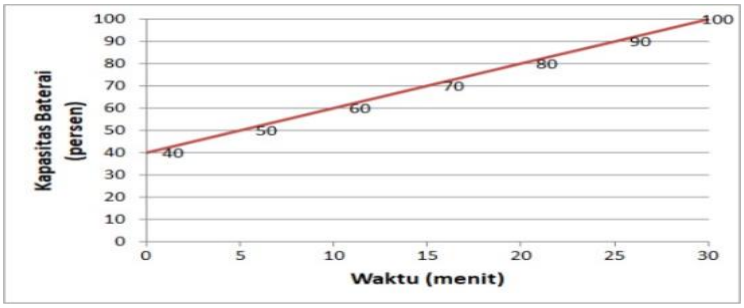
In this study, the instrument used is in the form of minimum competency assessment question tests that have been validated by 2 mathematics teachers at the school where this research is conducted. The validation results are considered worthy of being given to the research subjects. The test instrument given to students amounted to 8 questions that referred to the student's cognitive process, according to the International Association for The Evaluation of Educational Achievement (Knight 2020). The mental level of mathematical literacy on the minimum competency assessment is divided into 3 levels: knowing, applying, and reasoning. Aspects at the knowing level consist of remembering, identifying, classifying, calculating, retrieving/obtaining, and measuring. Aspects at the applying level consist of choosing strategies, stating/modeling, applying, and interpreting. Aspects at the level of reasoning consist of analyzing, integrating, evaluating, concluding, and making inferences, so 8 elements of the process are used that represent the 3 levels of cognitive processes, namely: remembering (linking with prior knowledge), integrating(making connections in the text), making inferences, concluding (summarizing text), identifying (vocabulary), calculating (mathematical thinking), retrieving/obtaining (through multimodal literacy), evaluating (through metacognition). The minimum competency assessment questions used by researchers with level 4 and 5 questions that are appropriate at the junior high school education level consist of math in short form and description (Wijaya & Dewayani, 2021)

Table 1. Cognitive Process

| Cognitive Process | Question |
|---|---|
| Linking to prior knowledge (Knowing level) | What did you already know about the relevant information in the text before you read the linear function text? |
| Making connections in the text (Reasoning level) | Based on the text, what are the steps needed to graph a linear function? |
| Making inferences (Reasoning level) | Can a linear function have a variable with more than one power?<br>☐ Yes ☐ No<br>Give reasons for your answer! |
| Vocabulary (Knowing level) | Pair the following vocabulary words with their mathematicalsymbols |

| Cognitive Process | Question |
|---|---|
| | (bolded)!<br>(Vocabulary related to linear functions)<br>Constant - - y = **mx** + c<br>Variables - - y = mx + **c**<br>Gradient - - y = **mx** + c |
| Summarize the text (Applying level) | Based on your understanding, summarize what alinear function means. |
| Mathematical thinking (Knowing level) | Solve this math problem using the following framework: Completethe table and find how long the stalactite has become 15 cm. |
| Multimodal literacy (Applying Level) | From the graph of battery capacity (percent) vs time (minutes) of Toni's cell phone charging, it can be concluded that the cellphone charging speed is .... |
| Metacognition/Evaluation (Reasoning Level) | Of all the questions above, which one do you think is easy, and which is difficult? Why? |

| x (tahun) | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| y (cm) | 5 | 6 | 7 | ... | ... | ... | ... | ... | ... | ..... | ... |




Before being given numeracy questions, students were given a brief article about Pacitan Cave and its relationship with linear functions. Some of the questions that researchers use are diagnostic test questions or tests of students' initial abilities related to Linear Function material. Questions are prepared based on the guidelines for compiling cognitive-process literacy assessments with the minimum competency assessment model (see Tables 1 and 2).

Table 2 Cognitive Score Guide

| Cognitive Process | – | √ | + |
|---|---|---|---|
| Linking to prior knowledge (Knowing level) | Learners do not make connections with prior knowledge | Learners make connections to prior knowledge but do not explain how this knowledge is used to understand the text. | Learners make connections to prior knowledge and explain how that knowledge is used to understand the text. |
| Summarizing Text (Distinguishing essential and less critical information) (Reasoning level) | Learners do not summarize the main idea accurately or do not distinguish between important and less | Learners summarize some main ideas but do not provide detailed information. | Learners summarize some main ideas and provide detailed information. |

| Cognitive Process | – | √ | + |
|---|---|---|---|
| | important information. | | |
| Making Inferences (Reasoning level) | Learners do not make inferences, or the assumptions they make are unrealistic. | Learners make realistic inferences but do not provide supporting evidence. | Learners make realistic inferences and cite supporting evidence |
| Mathematical Thinking (Knowing level) | Learners cannot answer the math problems given | Learners can answer the math problems given | Learners can answer and explain the math problems given correctly. |
| Making Connections Between Texts (Reasoning level) | Learners do not show linkages between texts | Some ideas attributed are inaccurate or irrelevant | Some attributed ideas are accurate or relevant |
| Multimodal Literacy (Applying Level) | Learner responses do not understand the data in the Multimodal text | Learner responses can read and understand the multimodal text, but answers are incomplete. | Learner responses can read and understand multimodal texts with complete answers. |
| Vocabulary (Knowing level) | Learners do not define math vocabulary. | Learners define some vocabulary | Learners define all the vocabulary and paraphrase the text. |
| Metacognition / Evaluation (Reasoning Level) | Learners cannot explain their method of understanding the problem | Learners are sufficiently able to show how they know the problem. | Learners can show how to understand the text, although it is incomplete. |

Description :
– = Low learners' abilities
√ = Students' abilities are moderate
+ = High student ability

## RESULT AND DISCUSSION

### Result

Table 3. Recapitulation of Student Cognitive Process Test Results

| Question | Cognitive Process | - | √ | + |
|---|---|---|---|---|
| 1. | Linking to Prior Knowledge | 4 | 5 | 13 |
| 2. | Making Connections in the Text | - | 1 | 21 |
| 3. | Creating Inference | 10 | 3 | 9 |
| 4 | Summarizing Text | 4 | 4 | 14 |
| 5. | Vocabulary | 1 | 2 | 19 |
| 6 | Mathematical Thinking | 22 | - | - |
| 7 | Multimodal Literacy | 18 | 1 | 3 |
| 8 | Metacognition / Evaluation | - | 11 | 11 |

Question No. 1 shows that 4 learners could not mention prior knowledge that could be used to understand the given text. Meanwhile, 5 learners were able to mention prior knowledge but could not explain how they used it to understand the text. A total of 13 learners already could use previous knowledge and were able to explain how they used it to understand the text. This data shows that most learners can connect with prior knowledge and explain how it is used to

understand the text. Teachers can use this data to set learning objectives by practicing strategies to activate prior knowledge.

Question No. 2 shows that no learners could not show the connection between ideas. Meanwhile, 1 learner did not accurately or relevantly show some linked ideas. A total of 21 learners already could show that some of the ideas linked were accurate and relevant. This data indicates that most learners already can show that some of the ideas linked are accurate and relevant. Teachers can use this data to set learning objectives by practicing various strategies to make connections between texts. The third line of question 3 shows that 10 learners did not make inferences or that the assumptions were unrealistic.

Meanwhile, 3 learners made realistic inferences but did not mention any supporting evidence. A total of 9 learners could make realistic inferences and mention supporting evidence. This data shows that most learners can make realistic inferences but cannot mention supporting evidence.

Question No.4 shows that as many as 4 learners have not been able to summarize the text, and learners have not been able to distinguish between essential information. A total of 4 can summarize some of the main ideas but have not provided detailed information. A total of 14 can summarize some main ideas and provide detailed information. This data shows that most can summarize several main ideas and provide detailed information. The fifth line of question 5 shows that 1 learner could not define vocabulary correctly.

Meanwhile, 2 learners were able to define vocabulary precisely. A total of 19 learners could describe the language and explain it. This data shows that most learners could organize all the vocabulary using their words and thoughts.

Question No. 6 shows that 2 learners cannot think mathematically and solve the problems given. The seventh row shows that 18 learners have not been able to understand the multimodal text. Meanwhile, 1 learner could read and understand the multimodal text, but the answer was incomplete. A total of 3 could read and understand the information from the multimodal text given, and the answers were complete. This data shows that most learners do not have multimodal literacy skills. Teachers can use this data to set learning objectives by practicing various literacy strategies in learning. The eighth row of question No. 8 shows that 11 learners could show how to understand the text, although it was incomplete. A total of 11 learners were able to show how they understood the text and were complete. This data indicates that most learners can understand a text, although it is incomplete. Teachers can use this data to set learning objectives by practicing various strategies for understanding a text or reading.

**Discussion**

The numeracy component consists of 3 (three) main parts: content, context, and cognitive processes. Content components in numeracy include number material, algebra, data, geometry, and measurement—the components of the context cover personal, socio-cultural, and scientific. Meanwhile, the elements of the cognitive process include understanding, application, and

reasoning. It is further explained that for the context of numeracy, there is also a personal context that focuses on a person's activities, family, or group. Then, the socio-cultural context is related to community or community problems, be they local, regional, national, or global. The scientific context is associated with applying mathematics in the universe and issues and topics related to science and technology. The cognitive process of numeracy is knowing, using, and reasoning (Sutama et al., 2022).

The similarity of this research with previous research, such as the research conducted by (Cahyanovianty & Wahidin, 2021) and the research undertaken by Novianti (2021), is to discuss minimum competency assessment problems and numeracy problems, especially mathematics material while distinguishing this research from other studies is to examine the cognitive process of students in solving the problem of minimum competency assessment. In educational psychology, cognitive processes are individual mental processes that can be understood as information processing (Nasution et al., 2022). In educational psychology, cognitive processes are needed to explore students' mental processes in a complex manner (Nasution et al., 2022). Based on the results of the analysis of the cognitive process that has been obtained, the most challenging process is the question of "Mathematical thinking," which is a cognitive process based on the level of understanding. Teachers can carry out learning activities by explaining and familiarizing students with answering mathematical problems using systematic steps to improve students' mathematical thinking. In "Multimodal Literacy," which is a cognitive process at the application level, students still feel challenged. Teachers can design activities that encourage students to conclude something from various multimodal texts with joint discussions to improve this cognitive process. The next question that students consider difficult is "Making Inferences", which is a cognitive process at the reasoning level. Teachers can carry out learning activities by involving students in group discussions to make inferences based on the information in the text and looking for the correct supporting evidence to improve students' ability to make inferences.

## CONCLUSION

The most difficult cognitive processes for students in class VIII A on linear function material are "Mathematical Thinking", "Multimodal Literacy," and "Making Inferences". It can be seen that there are only 3 people who can read and understand the information from the multimodal text provided. None of the students could think mathematically and solve the problems given. Nine students were able to make realistic inferences and mention supporting evidence. Of the 8 tested questions, students excelled in "Making connections between texts". This proves that the students' cognitive process and reasoning levels in the class are pretty good. As for the level of understanding and application level, it needs to be further improved. Suggestions for future researchers to make more varied minimum competency assessment questions and focus on deeper cognitive processes.

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