Integral : *Jurnal Penelitian Pendidikan Matematika*
p - ISSN 2654-4539
e – ISSN 2654-8720
Vol. 7 No. 2, Mei 2025

STUDENTS' MATHEMATICAL LITERACY SKILLS IN COMPLETING QUESTIONS IN TERMS OF ABSTRACT SEQUENTIAL THINKING STYLE

Fransiska Amelia Nathania Sudiono[1], Sunyoto Hadi Prajitno[2], Lydia Lia Prayitno[3]

[1,2,3] Universitas PGRI Adi Buana, Surabaya, Indonesia

E-mail: *fransiskamelia12@gmail.com [1)]*
nyoto_hp@unipasby.ac.id [2)]
lydialia@unipasby.ac.id [3)]

Abstract

Differences in thinking styles between one student and another student affect the mathematical literacy skills possessed by each student. This research was conducted to describe the mathematical literacy skills of students who have an abstract sequential thinking style in solving problems. This research used descriptive qualitative research. The research subjects consisted of 2 students of class VIII A SMPN 24 Surabaya who have abstract sequential thinking style. Data collection techniques were conducted through thinking style questionnaires, mathematical literacy tests, and interviews. This research used interactive model data analysis technique. The results showed that students with abstract sequential thinking style can meet all indicators on mathematical problem solving aspects, namely formulating problems systematically in accordance with the characteristics of this thinking style which is easy to find out significant important things and analyze information.

Keywords: Abstract Sequential; Mathematical Literacy; Thinking Style

INTRODUCTION

Technology and information are rapidly evolving, and literacy is fundamental in creating success in education, career and personal development. Literacy shapes individuals to understand, analyze and utilize information effectively. Therefore, students are required to have the ability of six basic literacies, one of which is numeracy literacy or also called mathematical literacy. Students who have this ability can understand and process information from concepts into a means to find solutions to problems and explain the results of the solutions obtained (Hanum et al., 2020). Likewise, Kurniawan & Djidu (2021) said that mathematical literacy is an individual's ability to identify and process problems systematically, and apply concepts to solve these problems. Wijaya & Dewayani (2021) also explained that the definition of mathematical literacy is the ability that individuals have to explain an event, solve problems, or make decisions in everyday life.

International evaluation of mathematics is seen in the Program for International Student Assessment (PISA). Mathematical reasoning and problem solving are the two aspects evaluated (OECD, 2023). Formulation of mathematical situations and the use of mathematical concepts, facts and procedures are included in the mathematical reasoning aspect. Interpretation, application and evaluation of mathematical results are part of the problem solving aspect. In an effort to obtain information on student achievement that is useful for educational improvement, the Government of Indonesia created the Minimum Competency Assessment program (Kementrian Pendidikan dan Kebudayaan, 2020). This assessment is an assessment of basic competencies tested on students to measure their ability to reason when faced with problems that require basic knowledge of mathematics (Hidayah et al., 2021). Assessment is the use of assessment tools to obtain information about the extent of student success in mastering certain competencies (Hasibuan, 2023). Sources from the Indonesian Education Report Card (Kemdikbud, 2023) at the Junior High School level show that students' mathematical literacy skills reach the medium category, where only 40.63% of students have mathematical literacy skills above the minimum competency. Based on observations of the Minimum Competency Assessment results, 4.44% of SMPN 24 Surabaya students have mathematical literacy skills below the minimum competency.

The main factors that influence mathematical literacy are external factors and internal factors (Fadilla et al., 2021; Istikhoirini & Fitri, 2022; Rahayu et al., 2020). External factors consist of learning methods and models, teaching materials, and classroom environment. On the other hand, internal factors can be seen from individual student relationships, including intelligence, self-confidence, motivation, and methods of receiving and processing information. According to Anthony Gregorc (in. DePorter et al., 2015), receiving and processing information is the basis of thinking styles.

Thinking style is the way individuals choose to use their abilities to solve a problem and conclude a solution to the problem (Nurlaeliyah, 2023). Thinking style is also a person's point of view on a problem and the response given to the problem (Izzati et al., 2023). The combination of receiving and processing information produces 4 thinking styles, one of which is abstract sequential. Tobias (in. Zufar & Dahlan, 2024) describes the characteristics of abstract sequential thinking style, namely collecting information accurately, analyzing and researching concepts, being interested in visual directions, describing situations logically, applying facts in proving theories, and easily understanding through observation.

Sourced from the research of Wasilatus Sa'adah (2021), with indicators of the level of mathematical literacy ability of PISA mathematics 2021 and using TIMSS type questions. Students with abstract sequential thinking styles have mathematical literacy skills below level 1. From the analysis, students are less able to answer questions with general situations where information and questions are available, and do general methods from clear instructions. In addition, students show less response according to the simulation. Meanwhile, Fajriati and Mardiyana (2023) used PISA-Like questions to expose students' mathematical literacy skills. In their research, students with abstract sequential thinking style can process systematic calculations. In addition, students are able to determine and represent and reason in complex situations. Shinta (2021) found that abstract sequential thinking style is able to represent data and symbols appropriately. Meanwhile, Wida Yanti et al. (2023) said students with an abstract sequential thinking style can identify and describe information, analyze available information and look for relationships from questions, and arrange solutions systematically.

Recognizing and understanding the way students think is a teacher's job that aims to facilitate learning activities and prevent interference from differences in each student's thinking style. Therefore, this study was conducted to describe students' mathematical literacy skills in solving problems that refer to the Minimum Competency Assessment and combine PISA mathematical literacy aspects with the cognitive level of the Minimum Competency Assessment as an indicator of mathematical literacy skills.

Based on the above statements related to students' mathematical literacy skills and the relationship between thinking styles and mathematical literacy skills as well as differences in opinions in previous studies, a study was conducted entitled “Students' Mathematical Literacy Skills in Solving Problems in View of Abstract Sequential Thinking Style.”

METHODS

By applying a descriptive qualitative research type that describes a problem, conditions and events accurately and systematically. This research is used to describe the mathematical literacy skills of students who have an abstract sequential thinking style in solving problems. The questions used to determine students' mathematical literacy skills are questions that refer to the Minimum Competency Assessment. While the indicators used to measure mathematical literacy skills are the combination of PISA mathematical literacy aspects with the cognitive level of the Minimum Competency Assessment.

The research was conducted at SMP Negeri 24 Surabaya in the 2024/2025 academic year. This school was chosen because based on initial observations, the problems that exist at the school are in accordance with the objectives of this study, namely to describe the mathematical literacy skills of students who have an abstract sequential thinking style in solving problems. In addition, no similar research has been found related to mathematical literacy skills at the school. The research was conducted in a period of 6 months, starting from July to December 2024. Data sources in this study used primary data sources obtained from the results of filling out questionnaires, the results of working on mathematical literacy tests, and interview results. The questionnaire was given to all students of class VIII A SMPN 24 Surabaya to find out the thinking style possessed by each student. Furthermore, the mathematical literacy test and interviews were conducted on 2 different subjects who have an abstract sequential thinking style. The determination of the subjects applied a purposive sampling technique that involved the teacher in determining the subjects with the criteria of having good communication skills and math scores above the minimum completion criteria.

The research instruments consisted of thinking style questionnaires, written tests, and interviews. The questionnaire used is a direct and closed questionnaire, where the questionnaire is distributed and filled in directly by someone who will be asked to answer according to himself and only give a mark on one of the answers deemed appropriate. The questionnaire in this study uses a thinking style questionnaire developed by John Park Le Tellier and assumed to be valid (DePorter et al., 2015). To make it easier for students to understand the contents of the questionnaire, modifications were made. The questionnaire contains 15 groups of words, each group of words consists of 4 words. Students will choose 2 out of 4 words in 1 word group. This questionnaire provides an overview of the classification of Gregorc's thinking styles, namely concrete sequential, abstract sequential, concrete random, and abstract random. The steps in preparing the thinking style questionnaire include: (1) Developing a thinking style questionnaire grid developed by John Park Le Tellier, (2) Making a thinking style questionnaire in accordance with the grid that has been made, (3) Making a thinking style questionnaire scoring guide sheet.

The test in this study uses a written and subjective test, which requires students to answer in the form of writing which is descriptive. In addition, from the level of freedom to answer questions, this test includes an extended response test that frees students in answering questions. The question consists of 1 description question that refers to the Minimum Competency

Assessment in the form of number content, scientific context, and the form of essay or description questions. Indicators of mathematical literacy ability combine aspects of PISA mathematical literacy with the cognitive level of the Minimum Competency Assessment. The steps for preparing the written test instrument include: (1) Developing a lattice of questions, (2) Making test instruments according to the lattice that has been made, (3) Conducting validity tests of questions through validators, (4) Analyzing the results of the validity test of test instruments, (5) Using test questions to 2 subjects.

Instrument testing uses content validity conducted by experts judgment, namely 2 lecturers and 1 teacher who is competent in the field of mathematics. Validators will provide scores for items according to a Likert scale with intervals of 1 to 4. This Likert scale consists of 4 indicates very good, 3 indicates good, 2 indicates less good, and 1 indicates not good. The scores obtained will be analyzed using Aiken V through the following equation.

$$V = \frac{\sum s}{n(c-1)} \quad \dots (1)$$

Notes:

V	:	Index of rater agreement
s	:	$s = r - lo$
n	:	Numerous raters
c	:	Lots of categories to choose from

The V index indicates the category of content validity level of an instrument. The following are the categories of instrument validity levels.

Table 1. Classification of Aiken's Coefficient V

Index V	Interpretation
$0 < V \leq 0{,}4$	Less Valid (Low)
$0{,}4 < V \leq 0{,}8$	Fairly Valid (Medium)
$0{,}8 < V \leq 1$	Highly Valid (High)

The validity test results from testing using Microsoft Excel software, obtained the V Index on the question items as follows.

Table 2. Test Validity

Question Item	V	Remarks
1	0,9333	Highly Valid

From Table 2, it can be said that item 1 in the mathematical literacy test has an Aiken V index with a very valid category. So that item 1 in this test instrument can be used in research.

Open-ended interviews were used in this research. The interview method used structured interviews where the questions had been designed beforehand. The questions asked were related to the answers from the mathematical literacy test that students had done. When conducting interviews, it is necessary to prepare a tool for recording in the form of a voice recorder. The steps in preparing the interview guideline instrument include: (1) Develop a grid of questions, (2) Make interview guideline question items according to the grid that has been made, (3) Test the validity of the question items through the validator, (4) Analyze the results of the interview guideline validity test. The steps for collecting interview data include: (1) Determining the subject to be interviewed, (2) Using interview guidelines on the subject that has been determined, (3) Conducting the interview process, (4) Confirming the summary or core of the interview results and ending the interview process, (5) Writing down the interview results, (6) Identifying the interview results obtained.

Similar to the test instrument, the interview guideline has also gone through content validity testing. The test was conducted by experts (expert judgment), namely 2 lecturers and 1 teacher who is competent in the field of mathematics. The following is the acquisition of the V Index on the interview guidelines.

Table 3. Interview Validity Test

Question Items	V	Remarks
1-10	0,873	Highly Valid

From Table 3, the question items in the interview guidelines have an Aiken V index of 0.873 with a very valid category, which means they can be used in this research.

Next, the data that has been obtained is analyzed using the interactive model data analysis technique which consists of 4 stages, including: (1) data collection, (2) data reduction, (3) data presentation, (4) conclusion drawing. The analysis process takes place continuously until saturated data is obtained. The benchmark for data saturation is characterized by no longer obtaining new data or information.

The data obtained in this study came from the results of the thinking style questionnaire, the results of the mathematical literacy test, and the results of the interview. The interview results were adjusted to the results of the mathematical literacy test results that had been done by the subject, so that the data was in accordance with reality.

Data reduction refers to the process and pattern of students' thinking in solving mathematical literacy test questions. There are several stages of data reduction. First, collecting and classifying the results of the thinking style questionnaire and mathematical literacy test which became the reference for the interview process. Second, listening carefully to the interview results and recording the interview results. Third, compiling the interview script using different codes.

To make it easier to see the research activities, the data is presented in the form of descriptions or other forms such as tables and diagrams. Meanwhile, in drawing conclusions, this research compares test results with interview results.

In addition to the analysis technique, the credibility test was also conducted. This research uses source triangulation technique through identification of test and interview results from 2 different subjects who have abstract sequential thinking style.

RESULTS AND DISCUSSION

Data related to thinking styles were taken from all students in class VII A at SMPN 24 Surabaya in the 2024/2025 academic year. Thinking style questionnaire answers were analyzed according to the scoring guidelines, then categorized based on each thinking style. The following is a list of thinking style questionnaire results.

Table 4. Questionnaire Results

Thinking Styles	Total
Abstract Sequential	6

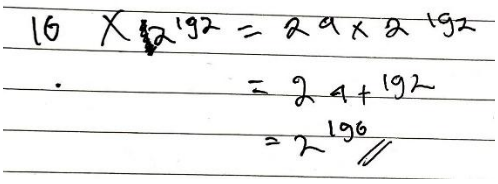
After the data was taken and categorized, continued by taking data on mathematical literacy skills through tests. The data was obtained from 2 different subjects. The following are the subjects and codes of the research subjects.

Table 5. Research Subjects

No	Subject	Subject Code
1.	ES	SSA_1
2.	RPF	SSA_2

Analysis of Mathematical Literacy Skills SSA_1

Figure 1. Test Results SSA_1



The test results show that in the aspect of mathematical reasoning, SSA_1 is less able to use procedures that are arranged systematically. This can be seen from the absence of writing the first step in preparing the solution. SSA_1 was able to identify the limitation of the model used to solve the problem. This can be seen from the selection of the right model. SSA_1 was less able to provide an explanation of the process used. This can be seen from the incomplete process. SSA_1 was able to interpret the mathematical result. This can be seen from the calculation process to get the correct result. SSA_1 is not able to draw conclusions and choose explanations. This can be seen from the absence of conclusions and explanations from the results obtained.

In the mathematical problem solving aspect of formulating the problem systematically, SSA_1 was unable to choose a representation that was appropriate to the context. SSA_1 was also unable to choose the representation that describes the problem. This can be seen from the absence of representations related to the information and questions in the problem. However, SSA_1 was able to understand the statements and questions to create a model. This can be seen from the problem solving process in accordance with the information in the problem. SSA_1 was also able to identify simplifications in a model. This can be seen from how to change the form of numbers. In addition, SSA_1 was able to simplify the problem to fit the mathematical analysis. This can be seen from the way in operating the power numbers.

In the mathematical problem solving aspect of using mathematical concepts, facts, and procedures, SSA_1 is less able to use procedures that are already known. SSA_1 was less able to use context understanding to find alternative solutions. SSA_1 was also less able to choose the right strategy. This can be seen from the absence of writing the initial steps used to compile the solution. However, SSA_1 was able to perform simple calculations. This can be seen from the correct calculation. SSA_1 was also able to present the result as seen from the final result given.

In the mathematical problem solving aspect of interpreting, applying, and evaluating mathematical results, SSA_1 was able to recognize the limits of mathematical solutions. This can be seen from the solution given in accordance with the question. SSA_1 was also able to identify the limitations of the model used to solve the problem. This can be seen from the selection of the right model. However, SSA_1 was less able to use procedures and limits in solving the problem. This can be seen from not writing the first step in solving the problem. SSA_1 was unable to compose and communicate the explanation of the result of the problem. SSA_1 was also unable to identify the effect of the result of the calculation so that the result is relevant to the real world context. This can be seen from the absence of explanation related to the results obtained.

Interview Results:

P	:	"What is known and asked in the question?"
SSA_1	:	"In this question, it is known that an amoeba that is observed is able to breed into 2 birds within 15 minutes. The question is how many amoebas are in the form of ranks for 48 hours if there are 16 amoebas."
P	:	"What are your steps to solve the problem?"
SSA_1	:	"So, $16 \times 2^{192} = 2^4 \times 2^{192}$. And then 2^{4+192}. The result is 2^{196}."
P	:	"What results did you get?"
SSA_1	:	"2^{196}."

The results of the interview show that in the aspect of mathematical reasoning, SSA_1 is not able to use a systematically arranged procedure. SSA_1 is able to identify model constraints by selecting the right model to solve problems. SSA_1 is not able to explain the process used. SSA_1 is able to interpret the results with the correct answer. SSA_1 is unable to draw conclusions and choose explanations from the results obtained.

In the aspect of mathematical problem solving in the section of formulating problems systematically, SSA_1 is able to choose representations according to the context. SSA_1 is able to select a representation that describes the problem. SSA_1 is also able to understand statements and questions to create models. This can be seen from the answer related to information about what is known and asked in the question. SSA_1 is able to identify the simplication of a model. SSA_1 is also able to simplify the problem. This can be seen from the answers related to how to change and operate numbers.

In the aspect of solving mathematical problems using mathematical concepts, facts, and procedures, SSA_1 is not able to use known procedures. SSA_1 is less able to use context understanding to find alternative solutions. SSA_1 is also less able to choose the right strategy. This can be seen from the absence of an explanation of the initial steps used to prepare the solution. However, SSA_1 is able to perform simple calculations by providing an explanation of the calculations performed. SSA_1 is also able to present visible results from the final results given.

In the aspect of mathematical problem solving in the section interpreting, applying, and evaluating mathematical results, SSA_1 is able to recognize the limitations of mathematical solutions by providing appropriate answers. SSA_1 is also able to identify the limitations of the model used by selecting the right model. However, SSA_1 is not able to use procedures to solve problems that can be seen from the lack of explanation regarding the initial steps. SSA_1 is not able to compose and communicate the explanation of the results of the problem. SSA_1 is also unable to identify the effect of the results of calculations so that the results are relevant to the real-world context. This can be seen from the absence of an explanation regarding the results obtained.

Analysis of Mathematical Literacy Skills SSA_2

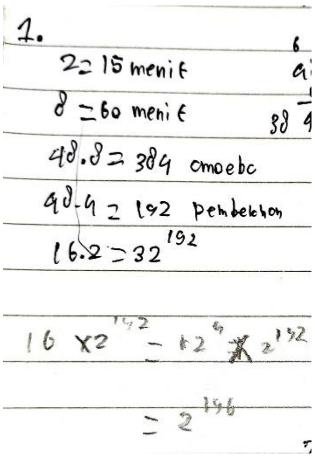


Figure 2. Test Results SSA_2

The test results show that in the aspect of mathematical reasoning, SSA_2 is able to use a systematically arranged procedure. This can be seen from the writing of the first steps in preparing the solution. SSA_2 is able to identify the constraints of the model used to solve problems. This can be seen from the selection of the right model. SSA_2 is able to provide an explanation of the process used. This can be seen from the complete process. SSA_2 is able to interpret mathematical results. This can be seen from the calculation process so that the correct results are obtained. SSA_2 is unable to draw conclusions and choose explanations. This can be seen from the absence of conclusions and explanations from the results obtained.

In the aspect of solving mathematical problems in the section of formulating problems systematically, SSA_2 is able to choose a representation that is appropriate to the context. SSA_2 is also able to select representations that describe the problem. This can be seen from the representation related to the information and questions in the question. In addition, SSA_2 is able to understand statements and question to create models. This can be seen from the problem-solving process according to the information in the question. SSA_2 is also able to identify simplifications in a model. This can be seen from the way the number is changed. SSA_2 is able to simplify problems to fit mathematical analysis. This can be seen from the way in operating ranked numbers.

In the aspect of solving mathematical problems using mathematical concepts, facts, and procedures, SSA_2 is able to use procedures that are already known. SSA_2 is able to use context understanding to find alternative solutions. SSA_2 is also able to choose the right strategy. This can be seen form the writing of the initial steps used to prepare the solution. SSA_2 is capable of performing simple calculations. This can be seen from the correct calculations. In addition, SSA_2 is able to present the results that can be seen from the final result.

In the mathematical problem-solving aspect of the section interpreting, applying, and evaluating mathematical results, SSA_2 is able to recognize the limitations of mathematical solutions. This can be seen from the solutions provided according to the questions. SSA_2 is also able to identify the limitations of the model used to solve problems. This can be seen from the selection of the right model. SSA_2 is able to use procedures and limitations in solving problems. This can be seen from writing the first steps in solving problems. SSA_2 is not able to compose and communicate the explanation of the results of the problem. SSA_2 is also unable to identify the effect of the results of calculations so that the results are relevant to the real-world context. This can be seen from the absence of an explanation regarding the results obtained.

Interview Results:

P	:	"What is known and asked in the question?"
SSA_2	:	"What is known is that 2 amoebas will divide every 15 minutes. The question is the number of amoebas in 48 hours and in multiplication form if there are 16 amoebas."
P	:	"What are your steps to solve the problem?"
SSA_2	:	"By counting one by one, every 2 amoebas will appear within 15 minutes. Then multiply it by 48. Then multiply it by 16 amoebas."
P	:	"What results did you get?"
SSA_2	:	"The result is that the amoeba divides itself by 2^{196}."

The results of the interview show that in the aspect of mathematical reasoning, SSA_2 is able to use a systematically arranged procedure. SSA_2 is able to identify model constraints by selecting the right model to solve the problem. SSA_2 is not able to explain the process used. SSA_2 is able to interpret the results with the correct answer. SSA_2 is less able to draw conclusions and choose explanations from the results obtained.

In the aspect of mathematical problem solving in the section of formulating problem systematically, SSA_2 is able to choose representations according to the context. SSA_2 is able to select representations that describe the problem. SSA_2 is also able to understand statements and questions to create models. This can be seen from the answer related to information about what is known and asked in the question. SSA_2 is not capable of identifying a simplification of a model. SSA_2 is also incapable of simplifying the problem. This can be seen from the absence of an explanation related to the simplification of calculations.

In the aspect of solving mathematical problems using mathematical concepts, facts, and procedures, SSA_2 is able to use procedures that are already known. SSA_2 is able to use context understanding to find alternative solutions. SSA_2 is also able to choose the right strategy. This can be seen from the explanation of the initial steps used to prepare the solution. SSA_2 is able to perform simple calculations by providing explanations of the calculations performed. SSA_2 is able to present visible results from the final results given.

In the aspect of mathematical problem solving in the section interpreting, applying, and evaluating mathematical results, SSA_2 is able to recognize the limitations of mathematical solutions by providing appropriate answers. SSA_2 is also able to identify the limitations of the model used by selecting the right model. SSA_2 is able to use procedures to solve problems that can be seen from the explanation of the initial steps. SSA_2 is not able to compile and communicate explanations of the results of problems. SSA_2 is also no less able to identify the influence of the results of calculations so that the results are relevant to the real-world context. This can be seen from the absence of an explanation regarding the results obtained.

Based on the above analysis related to the mathematical literacy ability from the test results and the results of interviews with abstract sequential thinking style subjects, the following are the results of the analysis of mathematical literacy abilities of abstract sequential thinking style subjects.

Figure 3. Results of Analysis

Aspects	Mathematical Reasoning					Mathematical Problem Solving: Formulating problems systematically					Mathematical Problem Solving: Using mathematical concepts, facts, and procedures					Mathematical Problem Solving: Interpreting, applying, and evaluating mathematical results				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
SSA_1	-	✓	-	✓	×	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	-	×	×
SSA_2	✓	✓	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-
SSA	-	✓	-	✓	×	✓	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓	-	×	×

Inthe aspect of mathematical reasoning, the subjects SSA_1 and SSA_2 fulfill indicators 2 and 4. In the aspect of mathematical problem solving in the section of formulating problems systematically, the subjects SSA_1 and SSA_2 fulfill all indicators. In the section using mathematical concepts, facts, and procedures, the subjects SSA_1 and SSA_2 fulfill indicators 4 and 5. In the section of interpreting, applying, and evaluating mathematical results, the subjects SSA_1 and SSA_2 fulfill indicators 1 and 2. This can be seen from the subject's answer that show the selection of mathematical models, model constraints and solution constraints, calculation processes, and presenting results.

Based on the results of the data analysis that has been carried out, students with an abstract sequential thinking style in the aspect of mathematical reasoning fulfill 2 indicators, namely (1) identifying the limitations of the model used to solve the problem and (2) interpreting the results or mathematical solutions to real-world situations. This result is in accordance with Gregorc's perception (in. DePorter et al., 2015) who said that the characteristic of the sequential thinking style is abstract, namely processing information logically.

In the aspect of mathematical problem solving in the section of formulating problems systematically, students with an abstract sequential thinking style fulfill all indicators, namely (1) choosing a representation that is appropriate to the context of the problem, (2) choosing a mathematical definition or representation that describes a problem, (3) reading, decomposing, and understanding statements, questions, tasks, and drawings to create a situation model, (4) identifying simplifications in a mathematical model, and (5) simplify or decipher a situation or problem to fit mathematical analysis. This results is in accordance with the perception of

Munahefi et al (2020) who said that the characteristics of the sequential thinking style are abstract, namely it is easy to know important things significantly and analyze information.

Students with an abstract sequential thinking style on the aspect of solving mathematical problems using mathematical concepts, facts, and procedures fulfill 2 indicators, namely (1) performing simple calculations and (2) concluding and presenting mathematical results or solutions. This results is in accordance with Gregorc's perception (dalam. DePorter et al., 2015) who said that the characteristics of the sequential thinking style are abstract, namely having high reasoning and using concepts.

In the mathematical problem-solving aspect of the section interpreting, applying, and evaluating mathematical results, students with an abstract sequential thinking style fulfill 2 indicators, namely (1) recognizing the limitations of mathematical concepts and solutions and (2) identifying the limitations of the model used to solve problems. The result is in accordance with the perception of Munahefi et al (2020) who said that the characteristics of the sequential thinking style are abstract, namely processing information logicallly.

From the research activities, it can be seen that there are several factors that influence abstract sequential thinking styles on mathematical literacy skills. First, process the information logically. This character makes it easier for students to read and interoret problems systematically and rationally, where this is needed in mathematical literacy. However, students become less flexible in dealing with problems that do not have clear procedures and require approaches or thinking outside of general situations. Second, knowing the important things significantly and analyzing the information. In mathematical literacy, this ability is very useful when students are faced with problems that require analysis of story problems or statistical data. Students are able to identify important information needed to solve the problem. In addition, students can divide and simplify complex problems for easy analysis. However, students tend to rely on obvious data or problems. Third, have high reasoning and use concepts. This character allows students to understand and relate various mathematical concepts well. However, student tend to find it difficult to adapt if new concepts are not introduced logically and gradually.

The advantage of this research is that it provides in-depth information through interviews that reveal the meaning and perception of individuals. In addition, this research is more flexible and adaptive so that it can adjust questions based on findings in the field, Meanwhile the shortcomings of this research lie in the lack of subjects to see the tendency of the data obtained.

In the Wasilatus Sa'adah (2021) research, students with an abstract sequential thinking style are less able to answer common problems with clear question, are less able to recognize information and do general ways of clear instructions, and are less able to show astions according to simulations. This is different from the results of research that show that students with this thinking style can represent statements and question in the question. In addition, students can identify models to use in solving problems. Meanwhile, in the research of Fajriati dan Mardiyana (2023), students with an abstract sequential thinking style think about concepts and analyze information logically. This is in accordance with the results of the study which shows that students with this thinking style can recognize the limitations of concepts that will be used in solving problems and elaborate problems to fit mathematical analysis.

From research conducted by Shinta (2021) it was found that the abstract sequential thinking style is able to represent data and symbols precisely. This is in accordance with the results of research that shows that students with an abstract sequential thinking style can represent and describe a problem. Furthermore, Wida Yanti et al. (2023) said that students with an abstract sequential thinking style can identify and describe information, analyze available information and look for relationships from questions, and systematically formulate solutions. This is in accordance with the results of the research where students with this thinking style can understand the statements and questions used to create the model accordingly.

The theoretical implications of the results of this research can enrich cognitive theories and thinking styles, especially in understanding individuals processing information. In additional, the results of this research provide a new perspective that can be used to design a more adaptive learning model. The results of this research can also strengthen or expan the theory of thinking style previously developed by Anthony Gregorc. The findings of this research can be empirical evidence that thinking style has an effect on the way individuals solve mathematical problems. Meanwhile, practically, the results of this research participate in developing effective and efficient learning models and methods. For students, the results of this research can increase awareness of their thinking style so that they will find ways to optimize it in learning. For teachers, the results of this research help teachers in recognizing the differences in thinking styles that each student has so that teachers can adapt learning methods to be more appropriate.

CONCLUSIONS AND SUGGESTIONS

Students with an abstract sequential thinking style have mathematical literacy skills in the aspect of mathematical reasoning that fulfill 2 indicators, namely (1) identifying the limitations of the model used to solve problems and (2) interpreting mathematical results or solutions to real-world situations. But it is not able to fulfill indicator (5), because it cannot give conclusions from the results obtained.

In the aspect of problem solving, the section of formulating a problem systematically fulfill all indicators, namely (1) choosing a representation that is appropriate to the context of the problem, (2) choosing a mathematical definition or representation that describes a problem, (3) reading, decomposing, and understanding statements, questions, tasks, and images to create a situation model, (4) identifying simplifications in a mathematical model, and (5) simplifying or describing the situation or problem to be appropite with mathematical analysis. The section using mathematical concepts, facts, and procedures fulfill 2 indicators, namely (1) performing simple calculations and (2) concluding and presenting mathematical results or solutions. The section of interpreting, applying, and evaluating mathematical results fulfill 2 indicators, namely (1) recognizing the limitations of mathematical concepts and solutions and (2) identifying the limitations of the model used to solve problems. But it is not able to fulfill indicators (4) and (5), because it cannot provide an explanation of the results obtained.

Based on the results of the research, there are several suggestions that can be given. First, teachers should recognize and understand the differences in thinking styles that each student has in order to adjust the learning model to be used so that learning becomes more effective. Second, students are expected to try to improve their mathematical literacy skills by learning to solve problems related to mathematical reasoning and mathematical problem solving. Third, the next research can conduct other research on students' mathematical literacy using other mathematical literacy questions and indicators.

REFERENCES

DePorter, B., Hernacki, M., & Abdurrahman, A. (2015). *Quantum Learning: Membiasakan Belajar Nyaman dan Menyenangkan / Bobbie De Porter & Mike Hernacki ; penerjemah Alwiyah Abdurrahman* (Ed. baru,). Kaifa Learning.

Fadilla, A. N., Relawati, A. S., & Ratnaningsih, N. (2021). Jurnal jendela pendidikan. *Jendelaedukasi.Id*, *01*(02), 48–60. https://www.ejournal.jendelaedukasi.id/index.php/JJP/article/view/6

Fajriati, A. S., & Mardiyana, M. (2023). Kemampuan Literasi Matematis Siswa Dalam Menyelesaikan Soal Pisa-Like Ditinjau Dari Gaya Berpikir. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *12*(3), 2785. https://doi.org/10.24127/ajpm.v12i3.7086

Hanum, A., Mujib, A., & Firmansyah, F. (2020). Literasi Matematis Siswa Menggunakan Etnomatematika Gordang Sambilan. *JIPMat*, *5*(2), 173–184. https://doi.org/10.26877/jipmat.v5i2.6777

Hasibuan, A. S. (2023). Penerapan Konsep Asesmen Kompetensi Minimum (AKM) dalam Meningkatkan Kemampuan Literasi dan Numerasi Pada Siswa di Sekolah Menengah Pertama Swasta Budi Insani. *SAJJANA: Public Administration Review*, *02*(02), 1–6.

Hidayah, I. R., Kusmayadi, T. A., & Fitriana, L. (2021). Minimum Competency Assessment (Akm):

An Effort To Photograph Numeracy. *Journal of Mathematics and Mathematics Education*, *11*(1), 14. https://doi.org/10.20961/jmme.v11i1.52742

Istikhoirini, E., & Fitri, A. (2022). Analisis Kemampuan Literasi Matematika Siswa Dalam Menyelesaikan Soal Tipe HOTS Kelas XI SMK Muhammadiyah Kajen. *Prosiding Konferensi Ilmiah Pendidikan*, *3*, 73–86.

Izzati, N., Nurhafika, & Rahmatina, D. (2023). Analisis Literasi Matematika Siswa Dengan Gaya Berpikir Sekuensial Konkret Dan Acak Konkret Dalam Menyelesaikan Soal Tipe Akm. *Jurnal Riset Pembelajaran Matematika*, *5*(2), 89–98. https://doi.org/10.55719/jrpm.v5i2.836

Kemdikbud. (2023). Rapor Pendidikan Indonesia Tahun 2023. *Merdeka Belajar*, 2023. https://raporpendidikan.kemdikbud.go.id/login

Kementrian Pendidikan dan Kebudayaan. (2020). AKM dan Implikasinya Pada Pembelajaran. *Pusat Asesmen Dan Pembelajaran Badan Penelitian Dan Pengembangan Dan Perbukuan Kementerian Pendidikan Dan KebudayaanPembelajaran Badan Penelitian Dan Pengembangan Dan Perbukuan Kementerian Pendidikan Dan Kebudayaan*, 1–37.

Kurniawan, R., & Djidu, H. (2021). Kemampuan Literasi Matematis Siswa :Sebuah Studi Literatur. *Jurnal Edumatic : Jurnal Pendidikan Matematika*, *2*(01), 24–30. https://doi.org/10.21137/edumatic.v2i01.468

Munahefi, D. N., Kartono, K., Waluya, B., & Dwijanto, D. (2020). Kemampuan Berpikir Kreatif Matematis pada Tiap Gaya berpikir Gregorc. *PRISMA, Prosiding Seminar Nasional Matematika*, *3*(January), 650–659. https://journal.unnes.ac.id/sju/prisma/article/view/37590

Nay, S. (2021). Analisis Kemampuan Representasi Matematis Peserta Didik Dalam Menyelesaikan Soal HOTS (High Order Thinking Skill) Ditinjau Dari Gaya Belajar dan Karakteristik Cara Berpikir di SMP Islam Ma'Arif 02 Malang. *University of Islam Malang Repository*.

Nurlaeliyah. (2023). Gaya berpikir dan gaya belajar peserta didik pada proses pembelajaran dalam persepsi psikologi pendidikan. *Pendidikan Dan Studi Islam*, *9*(1), 337–346.

OECD. (2023). Program For International Student (PISA) 2022 Assessment and Analytical Framework. In *OECD (Organisation for Economic Co-operation and Development) Publishing*. https://www.oecd-ilibrary.org/education/pisa-2022-assessment-and-analytical-framework_dfe0bf9c-en

Rahayu, D. U., Mulyono, & Cahyono, A. N. (2020). Kemampuan Literasi

Matematika Ditinjau Dari Gaya Kognitif Siswa Pada Model PBL Berbantuan LMS. *Seminar Nasional Pascasarjana 2020*, *2019*, 715–720.

SA'ADAH, W. (2021). Analisis Kemampuan Literasi Matematis Siswa Kelas Viii Smp Vip Al-Huda Kebumen Berdasarkan Gaya Berpikir Teori Gregorc Skripsi. *Eprints.Walisongo.Ac.Id*. https://eprints.walisongo.ac.id/id/eprint/16621/%0Ahttps://eprints.walisongo.ac.id/id/eprint/16621/1/1708056064_Wasilatus Sa_adah_Lengkap Tugas Akhir - Wsltssdh Math.pdf

Wida Yanti, A., Jaelani, A., & Silvia, S. (2023). Analisis Proses Berpikir Komputasi Siswa Dalam Menyelesaikan Soal Cerita Aljabar Ditinjau Dari Gaya Berpikir Sekuensial Abstrak Dan Acak Abstrak. *Prosiding Conference on Research and Community Services*, *5*(1), 19–30.

Wijaya, A., & Dewayani, S. (2021). Framework Asesmen Kompetensi Minimum (AKM). In *Badan Penelitian dan Pengembangan dan Perbukuan Kementerian Pendidikan dan Kebudayaan*.

Zufar, M. A., & Dahlan, U. A. (2024). *PEMETAAN GAYA BERPIKIR SISWA KELAS VIII REGULER MADRASAH MU ' ALLIMIN TAHUN AJARAN 2023-2024*. *11*(1), 29–37.