

# STUDENT ATTENTION IN SOLVING FUNCTION PROBLEMS

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# ABSTRACT

This study aims to describe the students' attention processes in solving functional problems. This research is a qualitative descriptive study, with subjects of 2 students taken from 8 students of secondary school. The results show that the students' attention process in solving functional problems was based on attentional characteristics, namely when students who answered correctly in solving questions and interview process, before and after reflection had complete cognitive attention structures. While students who answer incorrectly in solving problems have incomplete attention to cognitive structures, characterized by a lack of concentration in seeing the relationship between one mathematical object and another mathematical object. Attention characteristics in this study begin with recalling previous information and responding or giving feedback to problems by linking previous information with existing problems. Next analyze by breaking down information into smaller parts and easy to understand. The next step looks at the relationship between the decomposition process to get ways that can be used in the settlement process to obtain the final results that are part of decision making.

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## **INTRODUCTION**

Mathematics is an activity that is carried out every day that is related to patterns, sequences, structures or forms and the relationships between them. Mathematical material is organized regularly in a logical and hierarchical order. Therefore, in studying mathematical material students are required to think more deeply, so they can easily understand the material being taught. Deep mathematical understanding of a concept will be able to develop knowledge in the form of concepts or ideas possessed to solve mathematical problems (Yenni, 2017), and also can make students have high creative thinking skills (Widayanti & Aisyah, 2019). One of the mathematical material that is considered very important to learn its function. In line with the opinion (Darmadi, 2019) that students' descriptions of functions are needed in understanding the basic concepts of mathematics. For example to understand the concept of an up, down, or constant function, students need to have a picture or graphic picture of an up, down, or constant function. But the fact that happens, most students tend not to care about the learning that takes place. This is indicated by the presence of noise, like to doodle, unfocused, yawning, chatting, etc (Gunesch dan Feldkirch (in Wilson & Korn, 2007)), resulting in a process of decreased concentration in learning activities (Stuart and Rutherford in (Wilson & Korn, 2007)), this affects the understanding of the material being taught. Based on a survey conducted by TIMSS data in 2011, the average mathematics score of Indonesian students was 386, below the International average (500). Indonesia is ranked 40 out of 45 participating countries (Fahmi & Purwati, 2019).

Therefore, students are required to concentrate more and focus on learning. So that the material can be accepted and easily recalled when needed in solving problems, attention is needed. Attention is the process of directing our awareness to relevant stimuli while ignoring irrelevant stimuli around (McLeod, 2018); (Mason, 2003); Stuart (Wilson & Korn, 2007). This action is an important process because there is a limit to how much information can be processed at any given time, and attention allows us to ignore the unimportant in detail and focus on what's important. Through these attentions so that there is a change from the focus on an object by decreasing the focus on the general circumstances around, from responsiveness to acting on responses by the desire to achieve something (Posner, 2016). Therefore, attention is one important aspect of learning. Without attention, the process of transferring information or material delivered cannot be received optimally.

Studies related to attention, so far more emphasis on studies related to attention during the learning process undertaken (Mason, 2003; Wilson & Korn, 2007). Also besides, different studies are related to the Theory of Attention for the Cognitive System conducted by (Bridewell & Bello, 2016). The results of the study according to Mason shows that in learning there is a change in attention structure where when learning begins, most students pay close attention. But that attention only lasts for about the first 10 minutes. After that, there is usually a decrease in attention until learning ends. Therefore, changes are needed that are introduced as tools to explore student awareness and to arrange assignments, think about concepts, and enable students to expand assignments that benefit themselves. While (Bridewell & Bello, 2016) tend to say that attention provides a way to direct limited cognitive resources to the collection of available information. In the case of humans, this capacity allows selective mental processing, thus shaping what we see, think, and do. Importantly, attention has unusual characteristics so that people cannot direct it only to the outside, but also to their mental representation. In this way, attention naturally bridges perception, cognition, and action. Based on some of these studies indicate that there is no specific study in seeing how students' attention in solving mathematical problems.

The purpose of this paper is to describe students' attention in solving mathematical problems. Therefore, research questions can be formulated namely how students' attention in solving problems of function.

## **METHOD**

This research was carried out at SMP Negeri 6 Kairatu, Seram Barat. The type used in this research is descriptive qualitative research that aims to determine student attention in solving mathematical problems on the subject matter of function at SMP Negeri 6 Kairatu, Seram Barat. The subjects in this study were students of class VIII at SMP Negeri 6 Kairatu, Seram Barat, 8 students were taken as research subjects and then given essay test questions and asked to be completed with think aloud. In setting research subjects using snowball sampling techniques (Creswell, 2012). Snowball sampling is a data source sampling technique which at first the amount was not able to provide complete data, then had to find other people who could be used as data sources.

Data collection is done by providing material function tests. Test questions are arranged systematically to express student attention. Test questions completed by students are done by

way of thinking aloud (Creswell, 2012), where students work while expressing what they are thinking. After the test questions are completed, the next step of verbal data and written data collected from students are assessed for consistency. If there are inconsistent data, clarification is carried out by holding re-interviews. Furthermore, if it remains inconsistent, then the data is not used.

Data analysis in this research was carried out through several steps: (1) transcribing collected verbal data, (2) analyzing all available data from various sources, namely from the results of thinking aloud, interviews, observations that have been written in field notes, and results in the construction of students 'mathematical concepts, (3) conducting data reduction, (4) arranging in units which are further categorized by making coding, (5) describing thinking patterns through students' attention in solving mathematical problems, (6) analyzing thinking processes based on attention, (7) analysis of interesting things, and (8) drawing conclusions (Creswell, 2012).

## **RESULT AND DISCUSSION**

## Attention S1 and S2 in solving functional problems

Subject 1 and subject 2 are two subjects, hereinafter referred to as S1 and S2 as representatives of other students who have saturated data. In solving the problem function, S1 correctly answers the problem given, while S2 makes a mistake in solving the problem and can reflect the answer to be correct by the attention indicators. This means that in the process of problem-solving, attention S1 and S2 (responding, remembering, solving problems, analyzing, seeing relationships, and making decisions) is correct. Attention S1 and S2 in detail are described as follows.

## Attention Patterns S1

S1 in solving the problem function starts with reading the given problem. S1 tends to understand the problem given which is shown by being able to explain the purpose of the problem. S1 then work on the problem until getting the final result correctly. S1 is then allowed to reflect on the test questions given and be able to finish correctly again. Thus the answers obtained by S1 before and after reflection equal to the correct answer. S1 attention patterns can be seen in the following diagram 1.



Diagram 1. S1 Attention Process Before dan After Reflection

Based on diagram 1 (S1 attention process before dan after reflection) it appears that S1 has attention in solving mathematical problems, wherein the process of completing S1 it performs well and correctly without any mistakes. This is because there is a concentration of mind so that S1 focuses on solving the problem. In line with (Bridewell & Bello, 2016), attention facilitates conscious access so attention selectively enables the integration of information generated by various mental processes.

## **Attention Patterns S2**

S2 in solving a problem function starts with reading the problem and explaining the problem given. S2 tends to understand the problem given so that it directly resolves the problem until it finishes meaning that when students do not understand the problem it will have difficulty in solving it. In line with (Buschman, 2004) that if students do not understand the problem and do not understand the settlement procedure then students will experience difficulties experienced in solving the problem. S2 is then allowed to reflect on the results obtained, it turns out that S2 is aware of the mistakes made and tends to be able to correct these errors. The attention pattern of S2 can be seen in the following diagrams 3 and 4.



Based on diagram 2 (S2 Attention Process Before Reflection) and diagram 3 (S2 Attention Process After Reflection), it appears that S2 in solving mathematical problems there are still errors in the operation process and in making decisions in making the equation of the

given function. After S2 is asked to reflect on the results of its work, S2 can improve its work properly and correctly so that it meets attention indicators.

## Analysis of students' attention in solving the problem function

S1 attention process in solving function problems

When solving mathematical problems in the form of essay questions on the function material, S1 thinking patterns related to attention begin with the process of responding and solving problems. The process of responding to S1 occurs when a problem is given, S1 immediately works on the problem posed, while the process of solving the problem occurs when the S1 begins to read the problem raised then explains and understands the intended question of the problem given. This is indicated by the following fragment of student answers in figure 1.



Figure 1. explores understanding the problem

In addition to pieces of work, researchers also conducted interviews with S1 as follows.

- *P* : What information do you get after reading the question?
- S1 : eee function f(x) = ax+b, next value f(0) = 2 and f(3) = 23
- *P* : Apart from that, what would you look for?
- S1 : Yes, the values of a and b in order to form the new function requested sir

This is in accordance with the results of think-aloud S1, that the known function f(x) is ax + b. Then the value of f(0) is 2 and the value of f(3) is 23. Means that to create a new function, you must first find the values a and b.

Furthermore, S1 conducts an analysis based on the information it understands by first outlining f(0) = 2 to f(x) = ax + b so that it produces a(0) + b = 2. In addition, S1 also outlines f(-3) = 23 to f(x) = ax + b so that it gets -3a + b = 23. The results of the decomposition process are then called S1 as equations 1 and 2. This shows that in the process of problem-solving, students are required to describe in the form the smaller one. This is consistent with the opinion of Sternberg (E. Retnowati, 2008) that consciously processing a small amount of information from a large amount of information available. This is reinforced by the results of student work as follows in figure 2.



Figure 2. Exploration of the decomposition

After going through the analysis process, S1 then makes a relationship between the two equations, so S1 decides to use the elimination method to find the value of a. as shown in figure 3.

Jengan Menggunakan metale oliminusi a(a) 1b = 2 -5 0 +6 =23 500 221 12. - 5 a = -7

Figure 3. Exploration looking at relationships

This is confirmed by the S1 statement during the interview as follows.

- *P* : How do you produce value a = -7?
- S1 : from equations 1 and 2, I get in the form of two-variable linear equations so that it's easier for me to use the elimination method to find the value of a, so I get a = -7
- *P* : *Are you sure about the answer?*
- S1 : Sure sir, because I checked again

Based on the results of interviews shows that S1 can recall previous materials that have been taught so that it can be actualized in solving problems of function. This is in line with (Awh, Vogel, & Oh, 2006) which states that attention plays a central role in the selection and storage of recalled information. Also besides, (Prinz, 2013) explains the relationship between attention and conscious access where he believes that attention is needed and sufficient for awareness.

After obtaining a value, S1 then looks for value b but S1 does not see the relationship between the value of a with the existing equation. S1 tendency to use initial information on existing problems to find the value of b by assuming a(0) = 0. This shows S1 with the following piece of work.



Figure 4. Exploration looking at relationships

Based on the results obtained, S1 then begins to look for the final result as a process of decision making which is to make the function of the problem given by referring to the values a = -7 and b = 2. This is evident in the following fragment of student work in figure 5.



Figure 5. Exploration of decision making

This is confirmed by the following fragment of an interview.

- *P* : Where did you get the final function?
- S1 : Yes, sir, I get the function by substituting the values of a and b in their general form. The values a = -7 and b = 2.
- *P* : Where did you get the value of b?
- S1 : In the first equation sir, I immediately multiply ax0 = 0, so 0 + b = b, so I get b = 2.

Based on the final results shows that S1 is very understanding of the problem provided and can link previous information with existing problems. Also besides, S1 can analyze by breaking down existing information into smaller components so that it is easy to understand. According to Diedrich that if students can remember, solve problems, analyze, see relationships and make decisions then categorized these students can concentrate mental activities called attention. In line with this opinion, (E. Retnowati, 2008) suggests mathematics is closely related to the cognitive field because in it there is an element of reasoning that requires students to be able to think, remember, solve problems, and make decisions.

## S2 attention process in solving function problems

When S2 resolved the problem given, it appeared that S2 attention was incomplete. This is indicated by the error made by S2. Furthermore, S2 is allowed to reflect on the work, so that it can be improved and meets attention indicators completely and correctly. The initial attention process carried out by S2 starts from S2 solving the problem by writing down the initial information contained in the problem. This shows S1 can understand the purpose of the problem.

The next step S2 begins to analyze the initial information by breaking down into general form functions. In the decomposition process, S2 obtains two linear equations. This looks like the following fragment I figure 6.

F(-3) = 23 C(x) = a x + 6 C(-3) = axtb = 23 F101=2 2a(-3)+6=23 F(01 = ax+b==2 Pers 2 =a(0)+6=2 Pers 1 -- Jato = 23 = 0 at6 = 2

Figure 6. Exploration understands the problem and the decomposition process

Based on the fragment of work in Figure 6 according to the results of think aloud, S2 revealed that known functions f(x) = ax+b, f(0)=2 and f(-3)=23. Now, if you want to make a function of this problem, you must first find the values of a and b. To find the values a and b, it means that f(0) must be changed to a(0)+b=2 according to the known function. Furthermore, f(-3) is also done in the same way obtained a(-3)+b=23, so that two equations are obtained.

This is reinforced by the fragment of the results of the interview as follows.

- *P* : What information is obtained after reading the question?
- S2 : After reading the problem, note that f(x)=ax+b, f(0)=2 and f(-3)=23.
- *P* : From this information, the next step is what will be done?
- S2 : because the value of f(0)=2 means the value of x=0 with the value of f(x)=2, so I substitute to obtain the equation O(a)+b=2
- *P* : *Then, what else*?
- S2 : Likewise for f(-3)=23, if I substitute for the function obtained -3a+b=23 as equation 2
- *P* : Then what will you look for?
- S2 : Yes, here I want to make a new function, so I need to find the values of a and b

After S2 obtains the two equations, S2 then makes the relationship between equation 1 and equation 2 so it decides to use the elimination method to find the value of a. The following is a fragment of the results of student work in figure 7.



Figure 7. Exploration looks at the relationship in decision making

This is confirmed by the following fragment of an interview.

- *P* : How can you get the value of a = -7?
- *S2* : *Yes sir, I got the value of a by eliminating the two equations.*
- *P* : Why must use elimination method?

- *S2* : Because by chance the equation has two variables so I use elimination. The elimination method is the easiest.
- *P* : How do you know how to do it?
- *S2* : Because it was taught by the teacher when we learned the linear equation of two variables, sir

Based on the results of the interview, it appears that the S2 is very understanding of the problem at hand. Also besides, S2 also in finishing tends to be able to connect the material that has been studied with the problem to solve it well. This shows that S2 uses a good memory. By following what was stated by Dewi that one of the attention functions is someone in maintaining sensitivity in responding to stimulus and maintaining attention related to alertness.

After obtaining a value, S2 then looks for value b through the process of seeing the relationship between the equation and the value of an obtained so S2 decides to use the substitution method. In finding the value of b, S2 uses equation 2 as a reference to substitute the value of a, but in operation, S2 experiences an error. Based on these errors, S2 is difficult in making decisions in determining the final value of a given problem. This can be seen in the following work fragment in figure 8.



Figure 8. Exploration looks at the relationship in decision making[

S2 is then allowed to reflect on the results of the work created. In the reflection process, S2 realizes that an error has been made so that it can make revisions so that it gets the right results. From these results, S2 then decides to set the final grade. More can be seen in figure 9 and 10 in the following section.



Figure 9. The process of reflection

b. Micai Fungsinta t(x)=axtb E(x)=-7x+2

Figure 10. Exploration of decision making

According to the results of think-aloud S2 in completing, S2 revealed that by eliminating the two equations so that (working) I get the value of a = -7 by eliminating the variable b. Here, I can find the value of b by substituting the value of an in equation 2, so that (working on) I get the value of b = 2. So that I get the value of the function it means just replace the values a = 2 and b = -7 in the known general form of the function so that f(x) = -7x + 2.

This is reinforced by the fragment of the results of the interview as follows.

- *P* : Are you sure about the final result?
- S2 : (looking back) .... sorry sir, there is a mistake sir. There is no negative three (while pointing at work)
- *P* : *Then what's the right way?*
- *S2* : *It should be* 21+b=23. *So* b=2.
- *P* : Why did it happen?
- S2 : Yes, because I already got the value of a=-7. Then I substituted the value of an in equation 2 so I got the value of b=2.
- *P* : Furthermore, the final value of how?
- S2 : For the final value that is f(x) = -7x + 2. I get the function by substituting the values of a and b.
- *P* : Are you sure?
- *S2* : Yes, I am sure, I have checked again and I am sure there is nothing wrong again.

Based on the results of the interview, it appears that S2 in the process of completion in finding the value of b had an error. Mistakes experienced by S2 caused by a lack of concentration. Concentration is the ability to focus attention and thought on one object or activity for a certain time. Correspondingly, (Shapiro, Raymond, & Arnell, 2009) revealed limitations in spreading attention. This means that after someone sees a stimulus that is relevant to the task where they fail to see the second. Therefore, (Prinz, 2013) describes the relationship between attention and conscious access in which he believes that attention is needed and sufficient for awareness.

Thus, the overall process undertaken by S2 in solving functional problems is the process of remembering and responding, namely the process of S2 in remembering material that was taught and responding or giving feedback to the material being taught. Furthermore, S2 is also able to analyze by breaking down information into smaller parts and easy to understand. After that, S2 begins to see the relationship between the decomposition process to obtain ways that S2 can be used in the completion process to obtain the final results that are part of decision making. According to Diedrich that if students can remember, solve problems, analyze, see relationships and make decisions then categorized these students can concentrate mental activities called attention.

# CONCLUSION

Based on the results of research and discussion it can be concluded that students in solving mathematical problems already have a complete cognitive attention structure. Although there are students who make mistakes but can correct when doing reflection. The cognitive structure of attention can be known through the fulfillment of attention characteristics, namely recalling previous information and responding or giving feedback to problems by connecting previous information with existing problems. Next analyze by breaking down information into smaller parts and easy to understand. The next step looks at the relationship between the decomposition process to get ways that can be used in the settlement process to obtain the final results that are part of decision making..

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