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Analysis of students' thinking process in solving arithmetic sequence based on adversity quotient types

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ABSTRACT

This descriptive qualitative study aimed at describing students' thinking process in solving arithmetic sequence problems based on students' adversity quotient (AQ). Two students who have camper type of AQ and two students who have transition from camper to climber type of AQ were involved in this study. We employed a questionnaire to identify the type of AQ that students have, a test to collect data on students' problem-solving process, and an interview guideline to clarify students' thinking process in problem-solving. The collected data were analyzed by following a process consisting of data reduction, data presentation, and drawing conclusions or verification. The results revealed that the students who have camper type of AQ demonstrated an assimilation thinking process on the stage of understanding problem and devising a problem-solving plan, an accommodation-assimilation thinking process on the stage of devising a problem-solving plan, and an accommodation thinking process on the stage of looking back. As for students who have transition from camper to climber type of AQ, they have similar thinking process with that of the students who have camper type of AQ on the stage of understanding problem, devising a problem-solving plan, and executing the problem-solving plan, but these students demonstrated different thinking process on the stage of looking back. In the stage of looking back, the students who have transition from camper to climber type of AQ presented an accommodation-assimilation thinking process that can be found from their responses to the test and interview.

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INTRODUCTION

The success or the failure of an individual in his or her education, employment, and even life is determined by Adversity Quotient (AQ) (Irianti et al., 2016). Stoltz (2000) defines AQ as the capacity of an individual in dealing with problems. AQ assists individuals to strengthen their capacity or persistence in dealing with challenges and life problems within the context of daily life. From the perspective of mathematics and its learning process, AQ can be considered as the capacity that an individual possesses in dealing with or solving the mathematical problems (Widyastuti, 2015). According to Stoltz (2000) there are several forms and types of AQ. The first type is quitters. In an analogy, quitters are people who stopped climbing. Characteristics of quitters are working in sufficient portions, lack of enthusiasm to do something, easily discouraged and give up. The second type is campers. A simple analogy for these people is that they love camping. The hallmark of campers is that they have a passion for pursuing their goals, but they do not really pursue them. They often choose to stop at one point because they feel bored and less challenged. The third type is climbers. They are analogous to a climber. The characteristics of climbers are that they are thinkers, who are always visionary, think of an alternative plan, have high motivation, and pursue their goals, and they are creative people.

AQ and mathematics are interrelated, both of which are concerned with an important aspect of problem solving. When a teacher has data about his students with the AQ type, it can indirectly encourage the teacher to present mathematics problems which of course encourage students' mindsets to be creative in solving those problems (Wicaksono et al., 2018). In the context of mathematical learning, almost all points in the main learning goals within the school always lead to problem solving (Sanjaya et al., 2018) and also to internalizing thinking process as well as thinking skills that have been translated into the real situation (Matsuoka, 2007). Problem solving is a part of mathematical curriculum that has been very significant because through learning and solving process students exert the knowledge and the skills that they have internalized into the problem solving (Misu, 2014). In a stricter manner, mathematics is inseparable from problem solving (Ulya et al., 2014). Problem solving is an integrated part of mathematical learning (Bicer et al., 2013). Consequently, in solving mathematical problems there should be good mathematical process so that the learning goals of mathematics can be achieved in accordance with the expectation. Within the thinking process aiming at solving problems, students need a bridge that deliver them to the real-life context (Darojat & Kartono, 2016).

Learning about problem solving essentially refers to learning to think or learning to reason, namely thinking or reasoning about how to apply the knowledge that has been previously internalized in order to solve the problems that have never been found (Nissa, 2015). In mathematics learning, teachers should identity the students' thinking process that can be considered for designing the appropriate learning for their capacity (Wulandari, 2014). It can be argued that the students' learning process in solving problems becomes an important aspect that should be identified since learning process from one individual to another is different (Farib et al., 2019). In brief, within every mathematical learning process it is important to identify the students' thinking process in order to view or to assess their mathematical thinking skills (Farib et al., 2019) and also their problem-solving skills. The students' thinking process is difficult to identify in plain sight by the teachers (Lailiyah et al., 2020). The reason is that thinking process is a cognitive activity that takes place in the mental aspect or the mind of the students; therefore, the nature of thinking process is internal (Pramesti, 2014). With regards to the statement, one of the ways for viewing the students' thinking process is identifying the results of their work (Razzouk & Shute, 2012) or the students' responses toward the problem-solving test items (Lailiyah et al., 2020).

Mathematical problem solving refers to the thinking activities that have been directed to find solutions over the problems and includes the formation of response and selection over numerous possibilities (Solso et al., 2008). Thinking process refers to the sequence of mental events that takes place in natural or planned and systematic setting on the context of space, time, and media in use and that also results in changes toward the influencing objects (Kuswana, 2013). Then, thinking process itself is a process that begins with data retrieval, data processing, and data storage in memory so that the data can be retrieved from the memory at any time when they are needed for the subsequent processing (Siswono, 2007). An individual will perform any activity in order to reuse the knowledge that have been stored in his or her memory during their thinking process as they retrieve and process information so that the individual will be able to make conclusions and take decisions (Bakry & Bin Bakar, 2015; Widyastuti, 2015). Within the thinking process, there is a processing sequence between the information that has been retrieved and the scheme (cognitive structure) that has existed in the human brain. With regards to the statement, a child can be considered as an active individual if the child is able to establish his or her own knowledge through the cognitive capacity that the child has (Nurrohmah et al., 2020).

Every individual has knowledge structure in his or her brain (Piaget, 2002). Every new knowledge, experience, or information that has been internalized by an individual will be processed through adaptation by means of assimilation or accommodation process. If the assimilation process of an individual is unable to adapt the individual into his or her environment, then an imbalance will take place (Sopamena, 2017). Thus, the consequence is that accommodation will appear to the surface and cognitive structure will suffer from new structural changes (Hendrowati, 2015). In this case, when an individual thinks by means of assimilation and accommodation then the individual does not belong to the same stage of development (Slavin, 2008). This also includes when students solve the mathematical problems (Widodo & Wahyudin, 2018) and, specifically, Polya problem-solving helps students to be skillful in solving their problems (Isroil et al., 2017). In this case, one of the discerning factors is AQ (Widyastuti, 2015). AQ has contributed for solving mathematical problem. If somebody is climber, then he has more effort to complete the task for solving mathematical problem. According to the AQ level, students' thinking process in solving mathematical problems is different and, therefore, within the mathematics learning the problems should be emphasized

on the individual approach based on the AQ level of the students (Masfingatin, 2013). This study will be focused on grade XI students, where they have complex characteristics that will be set.

In the context of the present study, the problem-solving initiative will refer to the sequence that has been proposed by Polya (1973), which consists of understanding problem, problem-solving planning, executing plan, and rechecking the problem-solving. The objective of the current study is to identify students' thinking process in solving arithmetic sequence problems based on Piaget's theory from the perspective of level of AQ.

METHODS

The study was conducted in a natural setting (Afifuddin & Saebani, 2009). Therefore, the study implemented the qualitative (naturalistic) approach. The subjects of the study were grade XI students from Natural Science Program 2 and Natural Science Program 3 at a public senior high school in Banjarmasin, South Kalimantan. Then, the object of the study was the students' thinking process in solving the mathematical problems that had been found over the learning materials of arithmetic sequence from the perspective of AQ. The data in the study were gathered from the results of Adversity Response Profile (ARP) questionnaire and the assignment-based interview. ARP is an instrument used to determine the types of AQ among the students. Unlike other measures, tests or instruments, the ARP provides a new and very important overview of what drives a person and what may be preventing a person from unleashing his or her full potential (Stoltz, 2000). The indicators consist of control, origin, and ownership, reach, and endurance. Example of items of control indicator is "*berapa banyak kendali yang Anda rasakan terhadap sebuah peristiwa yang menimbulkan kesulitan*?" [how much control do you feel over an event that evokes difficulties?].

Based on the results of the ARP questionnaire that had been distributed to two classrooms, the researchers found two types of AQ subjects namely camper-type and camper-to-climber-transition type. Specifically, in grade XI of Natural Science Program 2, 22 (78.57%) students were categorized into camper-type and 6 (21.43%) students were categorized into camper-to-climber-transition type. In Natural Science Program 3, 19 (61.29%) students were categorized into camper-type and 12 (38.71%) students were categorized into camper-to-climber-transition type. The number of the students as research subjects who had been taken from both classes were four students that consist of two students who had been taken from each class for both the camper-type (C1 and C2) and the camper-to-climber-transition type (T1 and T2).

The data from the assignment-based interview were used in order to identify the thinking process of every AQ type in solving the problems, which took the form of questions and answers delivered by the students The researchers used the data in order to attain direct information from four students, consisting of two camper-type students and two camper-to-climber-transition-type students, with regards to the thinking process. In the study, the interview technique that the researchers had implemented was the non-structured interview. Interviews were conducted to simply dig up information about how students of each type worked on problem solving, not to find out patterns of problem solving. Interviews were conducted face-to-face, recorded and archived, with in-depth interviews. Specific to the context of the study, the objective of the non-structured method is to attain clear data about the thinking process among the students of grade XI in solving problems from the perspective of AQ.

In addition to interview, another instrument that had been implemented for viewing the students' thinking process was written test (Cronbach's alpha; $\alpha = 0.638$). The test item is as follows: "A brick factory is able to produce 1,000 bricks at the first month. Due to the addition on the number of the workers, the brick factory is able to increase the production by 200 bricks every month. If the production increase in production is constant, how many bricks will be produced within the next 10 months?". The problem-solving rubrics for identifying the students' responses on the written test is presented in Table 1. Furthermore, the thinking process of the students was seen from four fundamental concepts of learning theory proposed by Piaget (see Table 2) and the problem-solving initiative that had been referred to was the Polya's problem-solving sequence. The interconnection of thinking process and problem-solving is presented in Table 3. Last but not the least, the data analysis techniques that had been implemented in the study consisted of data reduction, data presentation, and conclusion drawing or verification.

RESULTS

This section provides information of our study results regarding students' thinking process in solving problem according to Polya's model based on students' work on the test and interview data and triangulation.

Table 1. Rubric of Polya's problem-solving

Polya's problem-solving stage	Descriptions	Score
Understanding the problem	Writing appropriately what have been found from and what have been asked by the test item	4
	Writing what have been found from and what has been asked by the test item with error	3
	Writing either what have been found from the test item or what have been asked by the test item	2
	Writing either what have been found from the item or what have been asked by the test item with error	1
	Not writing what have been found from or what has been asked by the test item	0
Planning the problem solution	Writing the formula that will be implemented appropriately and identifying the elements that are necessary for the problem solution under the accurate and systematic manner	4
	Writing the formula that will be implemented appropriately and identifying the elements that are necessary for the problem solution under the accurate but not systematic manner	3
	Writing the formula that will be implemented appropriately and identifying the elements that are necessary for the problem solution under systematic but incorrect manner	2
	Not writing the formula that will be implemented appropriately and making error in identifying the elements that are necessary for the problem solution	1
	Not writing the formula that will be implemented appropriately and not identifying the elements that are necessary for the problem solution	0
Executing the problem solution	Writing the problem solution based on the test item under the appropriate, complete and systematic manner	4
	Writing the problem solution based on the test item under the appropriate but incomplete and systematic manner	3
	Writing the problem solution based on the test item under the systematic but incorrect manner	2
	Writing the problem solution based on the test item under the incorrect manner	1
	Not writing the problem solution based on the test item	0
Looking back at the problem solution	Writing the steps of looking back at the answer under the appropriate and systematic manner	4
	Writing the steps of looking back at the answer under the appropriate but not systematic manner	3
	Writing the steps of looking back at the answer under the systematic but incorrect manner	2
	Writing the steps of looking back at the answer under the incorrect manner	1
	Not writing the steps of looking back at the answer	0

Source: Rahimayanti (2016, p. 52)

Thinking Process of Camper-Type Students in Problem-Solving

In this section, the way the camper-type students solved the problem was discussed by means of interview activities. The test item responses as well as interview responses of the subject C1 and C2 in each problem-solving stage are thoroughly discussed as follows.

Table 2. Indicators of thinking process

Thinking process	Descriptions	Indicators
Assimilation	Information that has been retrieved is in accordance with the scheme in the brain Problems that have been dealt with are in accordance with the scheme within the brain There is a direct integration between information or problems within the scheme in the brain	Students are able to retrieve information fluently Students are able to deliver information fluently and appropriately Students are able to solve problems fluently and appropriately
Accommodation	Information that has been retrieved is incomplete or not in accordance with the scheme within the brain Problems that have been dealt with are less or not in accordance with the scheme within the brain There is a scheme modification in order that the scheme will be in accordance with the information or the problems that have been dealt with	Students are able to retrieve information and solve problem accurately, but they take a long time to perform the thinking process Students solve the given problems inaccurately or students are unable to solve the problems Students have confusion when they retrieve information or solve the given problems Students change their response after they think that their previous response has been incorrect

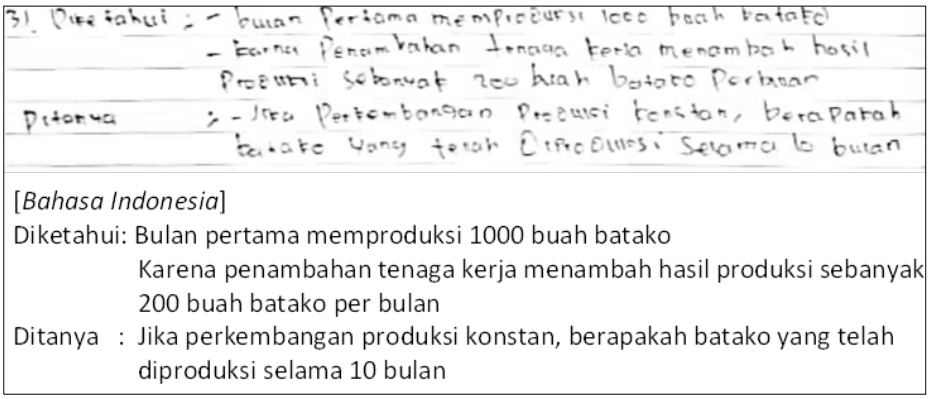
Source: Purnamasari (2019, p. 48)

Table 3. Thinking process rubric in problem-solving based on Polya

Problem-solving stage	Assimilation	Accommodation
Understanding the problem	Students are able to integrate directly the problems that they have been dealing with into the scheme within their brain so that they are able to define directly what they have retrieved from and what have been asked by the test item	Students are unable to integrate directly the problems that they have been dealing with into the scheme within their brain and, consequently, they take time in performing their thinking process (such as being silent or reading the test item over and over) in order to retrieve the information from and the question within the given test item
Planning the problem solution	Students make plan for the problem solution in accordance with the scheme within their brain (directly) and, therefore, they define directly the formula and the elements that will be necessary for the problem solution fluently	Students are unable to plan problem solution directly and, therefore, they need some time in processing the scheme modification; as a consequence, they will try to make some plan until they have found the appropriate problem solution
Executing the problem solution	Students are able to directly execute the problem solution based on the plan that has been made and also the accurate and correct calculation	Students are unable to directly execute the problem solution because they need some time in processing the information and they also take a long time in applying the problem solution that they have designed
Looking back at the problem solution	Students are able to directly confirm their answers by matching their answers and the information that have been retrieved from the test item	Students are not able to directly confirm their answers by using the information that they have retrieved from test item; therefore, they need some time to process the information (for example by re-reading the test item for confirming the final answer)

Subject C1 and Subject C2 in Understanding the Problem

The first stage of problem-solving based on Polya model is problem understanding. Based on the responses by subject C1 and subject C2 (Figure 1 and Figure 2), it was found that both subjects had been able to write down the information that they had appropriately retrieved and formulated from the given mathematical problem. As a result, subject C1 and subject C2 were able to adjust the information that they had retrieved to the scheme within their brain. Thus, the statement showed that both subjects had performed the assimilation thinking process on the stage of problem understanding. This finding was supported by the results of interview between researcher and the subjects (see Interview Transcript 1 and Interview Transcript 2).



[*Bahasa Indonesia*]
Diketahui: Bulan pertama memproduksi 1000 buah batako
Karena penambahan tenaga kerja menambah hasil produksi sebanyak 200 buah batako per bulan
Ditanya : Jika perkembangan produksi konstan, berapakah batako yang telah diproduksi selama 10 bulan

Figure 1. Problem understanding by subject C1

Interview Transcript 1
Researcher : Can you explain what you have identified in the test item?
Subject C1 : For the first month we have 1,000 bricks. Then, due to the addition on the number of the workers, the production has expanded into another 200 bricks per month.
Researcher : So, what has been asked by the test item?
Subject C1 : If the production increase is constant, how many bricks have been produced within the next 10 months?
Researcher : Do you find any difficulties in explaining the elements of the test items? Please explain!
Subject C1 : No.

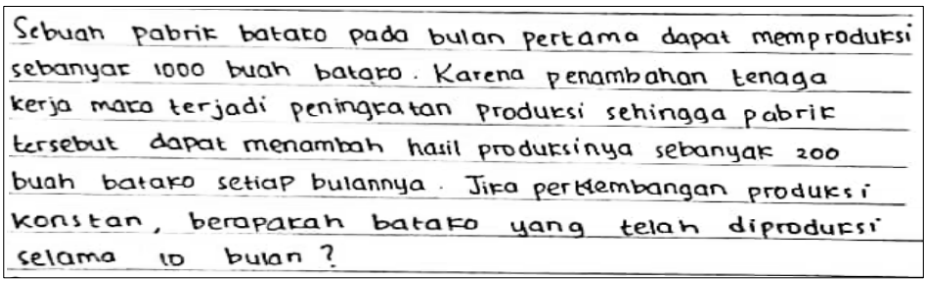


Figure 2. Information retrieving from test item and problem formulation by subject C2

Interview Transcript 2
Researcher : Can you explain what you have identified in the test item?
Subject C2 : $n = 10$, $a = 1{,}000$, and $b = 200$
Researcher : So, what has been asked by the test item?
Subject C2 : How many bricks have been produced within the next 10 months?
Researcher : Do you find any difficulties in explaining the elements of the test items? Please explain!
Subject C2 : Nothing.

Subject C1 and Subject C2 in Planning the Problem Solution

Based on the responses by subject C1 and subject C2 (Figure 3 (a) and Figure 3 (b)), it was found that both subjects had been able to appropriately plan the problem solution. Their skills were apparent from the formula that

had been implemented, namely the formula of arithmetic sequence that should be used in the problem solution within the next stage. The statement thus showed that both subject C1 and subject C2 had performed the assimilation thinking process on the stage of problem understanding. This finding was supported further in the following interview results (see Interview Transcript 3). Based on the Interview Transcript 3, it was found that both subjects had been able to complete the test item appropriately. At the same time, both of subject C1 and subject C2 had also planned the problem formulation appropriately since they had implemented the appropriate formula based on the symbols that they had found. Thus, it could be stated that both subjects had implemented the assimilation thinking process.

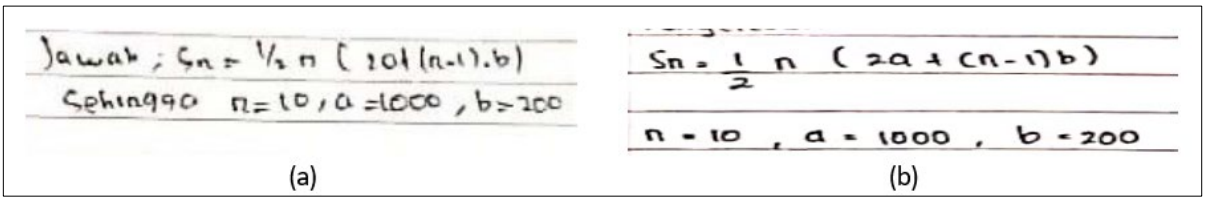


Figure 3. Problem solution planning by (a) subject C1 and (b) subject C2

Interview Transcript 3

Researcher : What strategy do you use for solving the mathematical test item?

Subject C1 : I follow up the existing steps by referring to the formula $S_n = \frac{1}{2}n(2a + (n-1)b)$.

Researcher : What strategy do you use for solving the mathematical test item?

Subject C2 : I refer to the formula $S_n = \frac{1}{2}n(2a + (n-1)b)$.

Subject C1 and Subject C2 in Executing the Problem Solution

Based on the responses by subject C1 and subject C2, it was found that there had been different answers. Subject C1 had executed less accurate step in the problem solution as having been seen by the multiplication (see Figure 4). In this regard, the correct answer should be 5 × 3,800 = 19,000, whereas the response that subject C1 had written was 17,500. This finding showed that subject C1 had performed the accommodation thinking process in this stage. On the other hand, subject C2 had performed the accurate problem-solving stage and therefore this subject had obtained the right answer (see Figure 5). In other words, subject C2 had performed the assimilation thinking process. These findings were supported by the interview results as presented in Interview Transcript 4.

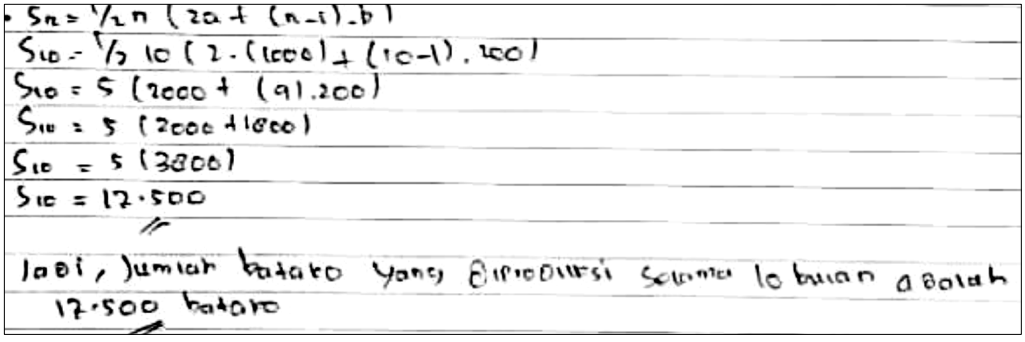


Figure 4. Problem solution executing by subject C1

Interview Transcript 4

Researcher : In your opinion, are the steps of problem solution, correct?

Subject C1 : Yes. They are already correct

Subject C2 : Yes, they are.

From the Interview Transcript 4, it was clear that subject C1 had been sure with the steps of problem formulation that had been performed despite the incorrect answer that had been displayed. There was an inaccuracy in the final step of the problem solution. As a result, it could be concluded that subject C1 had performed the accommodation thinking process. As for subject C2, it was clear that subject C2 had been sure with the steps of problem

formulation that had been performed. Since subject C2 had correctly solved the test item, it could be defined that subject C2 had performed the assimilation thinking process.

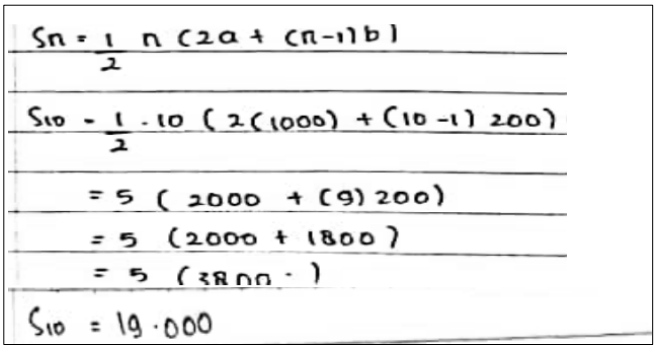


Figure 5. Problem solution executing by subject C2

Subject C1 and Subject C2 in Looking Back at Their Problem Solution

Subject C1 proved the answer but only through the U_n value (see Figure 6). Therefore, subject C1 found the incorrect answer. Furthermore, subject C1 also made mistake within the final step of the calculation as having been implied by the incorrect answer. Therefore, it could be stated that subject C1 had performed the accommodation thinking process since the subject had attained the incorrect answer.

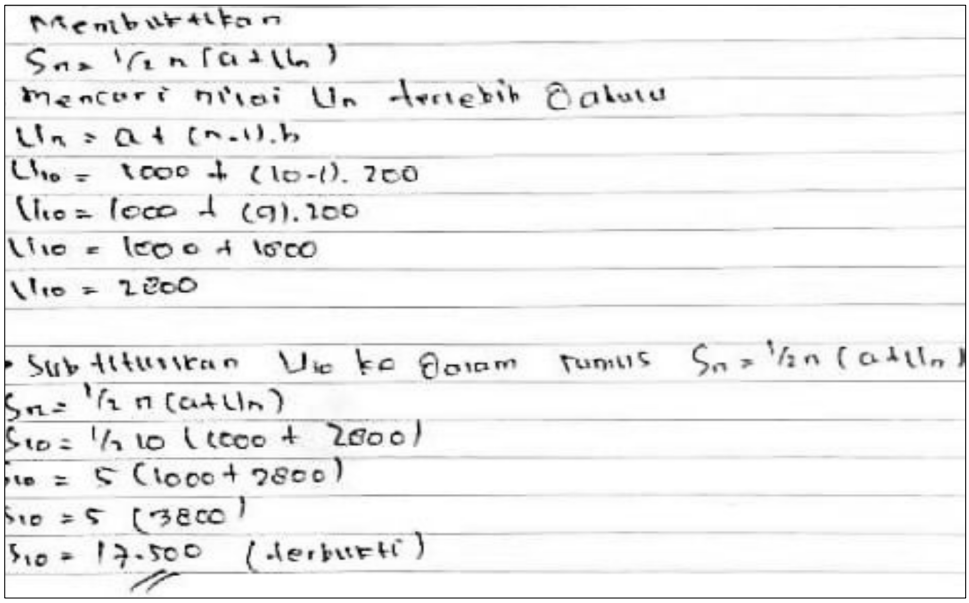


Figure 6. Looking back by subject C1

Subject C2 proved the answer but only through the U_n value (see Figure 7). Furthermore, subject C2 also found the incorrect answer. Subject C2 also made mistake in the calculation as having been reflected in the final answer, namely 19,000, which should be intended for the U_n instead of S_n. Therefore, it could be stated as well that subject C2 had performed the accommodation thinking process since the subject had attained the incorrect answer.

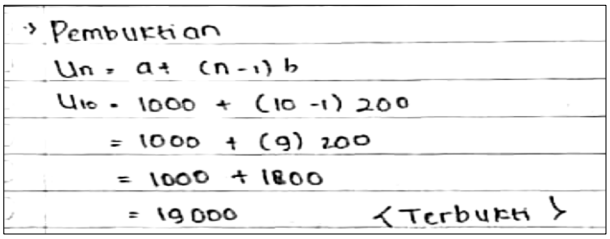


Figure 7. Looking back by subject C2

The results of the interview with the subject C1 and the subject C2 (see Interview Transcript 5) showed that both subjects had performed the accommodation thinking process on the stage of looking back at the process and the result.

Interview Transcript 5

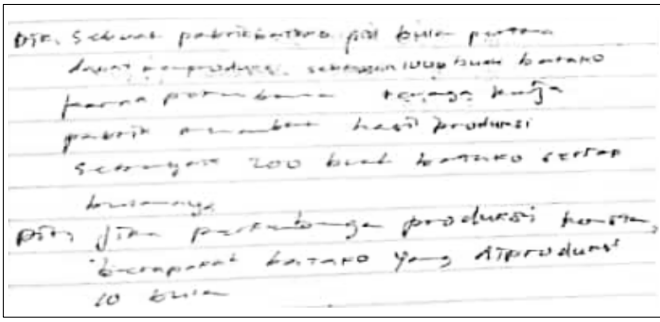
Researcher : Have you looked back at your answer?
Subject C1 : Yes, I have.
Researcher : How many times do you look back at your answer?
Subject C1 : Twice.
Researcher : Did you attain the solution through another way?
Subject C1 : No, I did not.
Researcher : Have you looked back at your answer?
Subject C2 : Yes, I have.
Researcher : Did you attain the solution through another way?
Subject C2 : No, I did not.

Thinking Process of Camper-to-Climber-Transition-Type Students in Problem-Solving

Just like the camper-type students that had been discussed in the previous section, in this section, the way the camper-to-climber-transition type students solved the problem was discussed by means of interview activities. The test item responses as well as interview responses of the subject T1 and T2 in each problem-solving stage are thoroughly discussed as follows.

Subject T1 and Subject T2 in Understanding the Problem

Based on the responses by subject T1 (Figure 8) and subject T2 (Figure 9), it was found that both subjects had been able to write down the information that they had retrieved and formulated form the mathematical problems appropriately. As a result, subject T1 and subject T2 were able to adjust the information that they had retrieved to the scheme within their brain. The statement thus showed that both subject T1 and subject T2 had performed the assimilation thinking process on the stage of problem understanding. This finding was supported further in the Interview Transcript 6 and Interview Transcript 7. Based on the results of the interview with both subjects, it could be concluded that both subject T1 and subject T2 had performed the assimilation thinking process in the stage of understanding the problem.



[*Bahasa Indonesia*]
Dik[etahui]: Sebuah pabrik batako pada bulan pertama dapat memproduksi sebanyak 1000 buah batako. Karena penambahan tenaga kerja pabrik menambah hasil produksi sebanyak 200 buah batako setiap bulannya
Dit[anyakan]: Jika penambahan produksi konstan, berapakah batako yang diproduksi 10 bulan

Figure 8. Problem understanding by subject T1

Interview Transcript 6

Researcher : Can you explain what you have identified in the test item?
Subject T1 : A brick factory is able to produce 1,000 bricks per month. Then, the factory has production increase, resulting in its capacity to produce an additional production of 200 bricks per month.
Researcher : So, what has been asked by the test item?
Subject T1 : If the production increase is constant, how many bricks have been produced within the next 10 months?
Researcher : Do you find any difficulties in explaining the elements of the test items? Please explain!
Subject T1 : No.

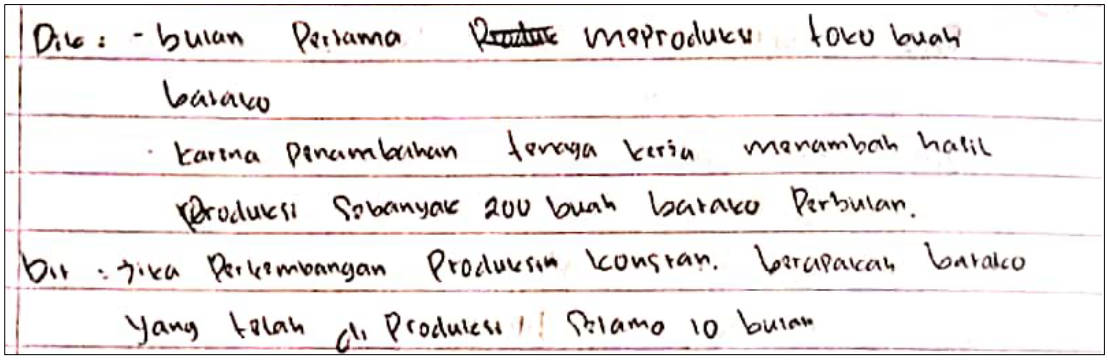


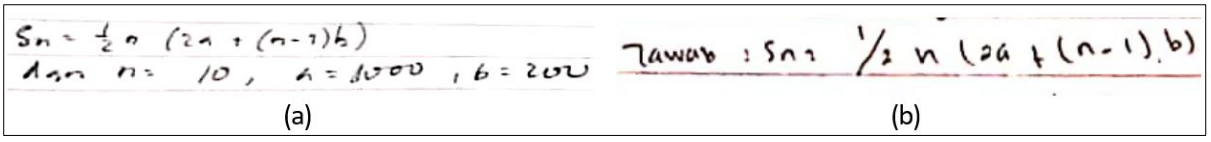
Figure 9. Problem understanding by subject T2

Interview Transcript 7

Researcher : Can you explain what you have identified in the test item?
Subject T2 : A brick factory produces 1,000 bricks per month. Then, the factory has production increase so that it able to produce additional 200 bricks in every month.
Researcher : So, what has been asked by the test item?
Subject T2 : If the production increase is constant, how many bricks have been produced within the next 10 months?
Researcher : Do you find any difficulties in explaining the elements of the test items? Please explain!
Subject T2 : No. I have no difficulties at all.

Subject T1 and Subject T2 in Planning the Problem Solution

Based on the responses provided by subject T1 and subject T2 (see Figure 10 (a) and Figure 10 (b)), it was apparent that both subjects had been able to plan the problem solution appropriately by referring to the formula of arithmetic sequence that should be implemented for the next stage of problem solution. Thus, it could be stated that both subjects had implemented the assimilation thinking process. This finding was supported further by the interviews (see Interview Transcript 8).



(a) (b)

Figure 10. Problem solution planning by (a) subject T1 and (b) subject T2

Interview Transcript 8

Researcher : What is your strategy for solving the problem?
Subject T1 : I use the formula $S_n = \frac{1}{2}n(2a + (n-1)b)$.
Subject T2 : I solve the problem by using the formula $S_n = \frac{1}{2}n(2a + (n-1)b)$.

Based on the interview responses from both subjects, it was clear that subject T1 and subject T2 had been able to complete the test item appropriately. At the same time, it was also clear that both subject T1 and subject T2 had been able to plan the problem solution appropriately since they had been able to use the formula appropriately in accordance with the symbol that had been found. In other words, it could be defined that both subjects had been able to perform the assimilation thinking process.

Subject T1 and Subject T2 in Executing the Problem Solution

In this stage, it turned out that subject T1 and subject T2 had differences in executing their problem solution plan (see Figure 11 and Figure 12). Referring to the final answer, both subject T1 and subject T2 displayed similar situations with that of subject C1 and subject C2. This finding showed that subject T1 had performed the accommodation thinking process, while subject T2 had performed the assimilation thinking process. Definitely, subject T2 was able to solve the problem appropriately and thus arrived at the correct final answer. These findings were supported by the interview responses (see Interview Transcript 9).

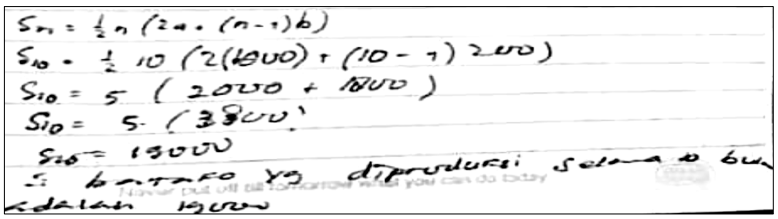


Figure 11. Problem solution execution by subject T1

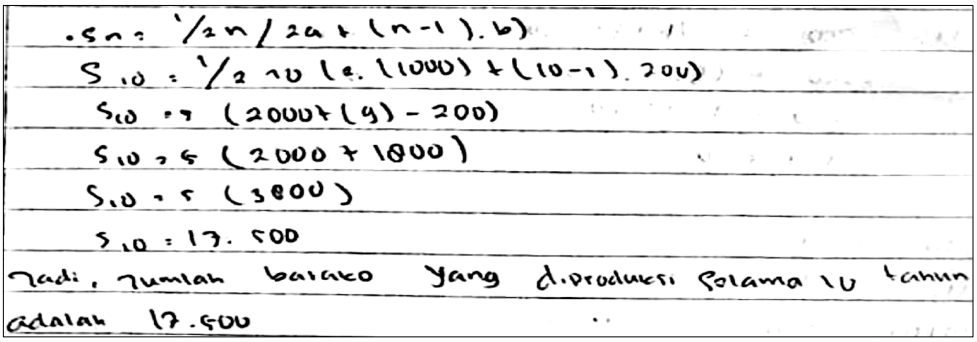


Figure 12. Problem solution execution by subject T2

Interview Transcript 9

Researcher : In your opinion, do you think that your problem-solving procedures have been appropriate?
Subject T1 : No, they have not [been appropriate].
Subject T2 : No, they have not [been appropriate].

Interview Transcript 9 showed that subject T1 had not been sure with the answer that had been attained as having been reflected by subject T1's response. Therefore, it could be stated that subject T1 had performed the accommodation thinking process. Subject T2, in the other hand, had been sure with the answer that had been attained, as having been reflected by subject T2's response. Therefore, it could be said that subject T2 had performed the assimilation thinking process.

Subject T1 and Subject T2 in Looking Back at Their Problem Solution

Based on subject T1's work on the test, it can be said that subject T1 had looked back at the answer that had been attained but he had not completed the calculation procedures. The reason was that subject T1 had only looked for the U_n value and had not been able to find the S_n value. In other words, it could be stated that subject T1 had performed the accommodation thinking process. This finding was supported by interview between researcher (see Interview Transcript 10). Interview Transcript 10 shows that subject T1 had only been able to identify the U_n value and subject T1 had not substituted the U_n value into the S_n formula.

Interview Transcript 10

Researcher : Have you looked back at your answer?
Subject T1 : I barely have time to do that.
Researcher : Did you attain the solution through another way?
Subject T1 : No, I did not.

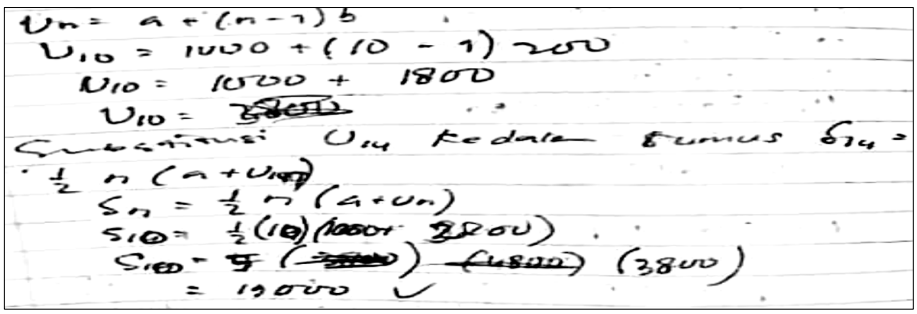


Figure 13. Looking back by subject T2

Figure 13 indicates that subject T2 had looked back at the answer by calculating the U_n value first and then subject T2 substituted the U_n value to the formula $S_n = \frac{1}{2}n(2a + (n-1)b)$ appropriately. Since subject T2 had checked the overall process and result, it could be stated that subject T2 had performed the assimilation thinking process. Subject T2 had been able to complete the test item well. As having been reflected in the Interview Transcript 11, subject T2 looked for the U_n value first and then subject T2 substituted the U_n value into the S_n formula. Therefore, it could be concluded that subject T2 had performed the assimilation thinking process.

Interview Transcript 11

Researcher : Have you looked back at your answer?
Subject T2 : Yes, I have.
Researcher : How many times did you look back at your answer?
Subject T2 : Twice.
Researcher : Did you attain the solution through another way?
Subject T2 : Yes, I did.
Researcher : How did you do that?
Subject T2 : I did that by looking for the U_n value and then substituting the U_n value into the formula $S_n = \frac{1}{2}n(2a + (n-1)b)$.

Triangulation

Based on the problem-solving test item response and the interview response, the researchers performed a comparison in order to define the validity of the data that had been attained (Chabibah et al., 2019). The comparison was performed through both source triangulation and technique triangulation in order to define the thinking process of the students in every problem-solving stage. The results of the source triangulation are provided in Table 4, while the results of the technique triangulation are provided in Table 5.

During the written test administration, the camper-type students performed the assimilation thinking process in understanding the problem and planning the problem solution, the accommodation-assimilation thinking process in executing the problem solution, and the accommodation thinking process in looking back at their answer. Then, during the interview, the camper-type students had the thinking process that had been similar to the ones in the written test. On the contrary, the camper-to-climber-transition-type students performed the thinking processes that had been similar to those of the camper-type students in understanding the problem, planning the problem solution, and executing the problem solution. However, these students performed the accommodation-assimilation thinking process in looking back at their answers from the perspective of both the test item responses and the interview responses.

Table 4. The results of the source triangulation

Problem-solving stage	C1	C2	Conclusion	T1	T2	Conclusion
Understanding problem	AL	AL	AL	AL	AL	AL
Planning problem solution	AL	AL	AL	AL	AL	AL
Executing problem solution	AD	AL	AD - AL	AD	AL	AD - AL
Looking back at the problem solution	AD	AD	AD	AD	AL	AD - AL

Note: AL: Assimilation; AD: Accommodation; and AD - AL: Accommodation - Assimilation

Table 5. The results of the technique triangulation

Problem-solving stage	Test[1]	Interview[1]	Conclusion	Test[2]	Interview[2]	Conclusion
Understanding problem	AL	AL	AL	AL	AL	AL
Planning problem solution	AL	AL	AL	AL	AL	AL
Executing problem solution	AD - AL	AD - AL	AD - AL	AD - AL	AD - AL	AD - AL
Looking back at the problem solution	AD	AD	AD	AD - AL	AD - AL	AD - AL

Note:
[1]Camper-type;
[2]Camper-to-climber-transition-type;
AL: Assimilation; AD: Accommodation; and AD - AL: Accommodation - Assimilation

DISCUSSION

Problem-Solving Skills of Camper-Type Students and Camper-to-Climber-Transition-Type Students

Thinking is a dynamic process that takes place in every mental activity of human being and is useful for solving problems, making decisions, and understanding something (Purwanto et al., 2019). With regards to the statement, students' thinking pattern in every problem-solving stage is very dynamic, especially from the perspective of AQ. Furthermore, in a more specific manner, the problem-solving skills that the camper-type students have consist of being able to understand the problem well, being able to define the information that has been retrieved and the information that should be identified well, being able to plan the problem solution by using the appropriate formula, and not having difficulties in executing the problem solution (Darojat & Kartono, 2016). At the same time, the camper-type students also look back at their answer again (Widyastuti, 2015). However, these students have not been maximum with their problem solution because they still have calculation errors, checking errors, and inaccuracy (Darojat & Kartono, 2016). The camper-type students indeed go through three problem-solving stages but they have been less capable in looking back at both their process and their result (Chabibah et al., 2019).

From the problem-solving written in the test item response and interview response, it is apparent that the camper-type students display efficiency and effectiveness in their answer (Stoltz, 2000). The reason is that the camper-type students are being efficient with their answer, but unfortunately, they are not able to mention any other way or method for solving the given problem (Ningrum, 2017). However, they are able to explain the results of their work fluently and correctly (Chabibah et al., 2019). In addition to the statement, the camper-type students can easily get satisfied with the answer that they have attained (Yani et al., 2016). For example, when they are asked to look back at their answer, the camper-type students do immediately look back at their answer; instead, they are a little bit unwilling to do so. Although the camper-type students display efficiency and effectiveness, they have quite fluent thinking process and still try to complete the test items with the best answer (Chabibah et al., 2019). All findings in this regard show that the theory proposed by Stoltz (2000) has been confirmed since these findings imply that the camper-type students easily get satisfied with what they have achieved and, therefore, they often neglect the other possibilities that might be attained.

Similar situations are also found in the camper-to-climber-transition-type students. These students have good skills in the three preliminary problem-solving stage. However, the findings of this study show that one of the camper-to-climber-transition-type students who has been able to look back again at the solution that has been attained because the student is also inclined the climber-type students, who have been able to perform the looking back stage (Mardika & Insani, 2017). Indeed, there is a mixture from the climber-type students. The climber-type students have creative thinking skills and strive forward to find the right answer (Stoltz, 2000). In addition, the findings of the study also show the inclination of these students to either the camper-type or the climber-type students. The students who are inclined to the camper-type have pure similarities with the camper-type students, whereas the students who are inclined to the climber-type students are able to think creatively and try another method or another way to solve the given problem (Mardika & Insani, 2017).

Thinking Process of Camper-Type Students and Camper-to-Climber-Transition-Type Students

The thinking process of both camper-type students and camper-to-climber-transition-type students are also very dynamic. Both types of students have assimilation thinking process in the problem-solving stage that has relatively been easy, namely understanding the problem and planning the problem solution. In addition, both types of students tend to be similar in executing the problem solution. However, the camper-type students have not fully internalized the complete concept understanding (Retna et al., 2013). Consequently, the students have errors or inaccuracy while they are looking back at their process and their answer. However, the camper-type students have been able to assimilate and integrate the new information that they have retrieved into the scheme in their mind (Yani et al., 2016).

On the contrary, the camper-type students are not fluent in executing the strategy that they have chosen since they have been unable to define the correct answer in the looking-back stage. Therefore, in the looking-back stage, the camper-type students tend to perform the accommodation thinking process in which they adjust their scheme into the new information and experience that they have attained (Santrock, 2009). The accommodation thinking process is performed because the camper-type students have been less maximum in implementing several problem-solution procedures such as the inaccuracy in the final calculation despite the correct procedures. In

case of the problem solution stage, the camper-type students perform both the assimilation and the accommodation thinking process (Yani et al., 2016). In fact, the camper-type students perform the accommodation thinking process on the looking-back stage as having been confirmed by the inappropriate process of finding the final answer (Nahdataeni et al., 2015).

Last but not the least, as having been previously explained, the thinking process of the camper-to-climber-transition-type students are also dynamic. The students with this category of AQ can be the representatives for both the camper-type students and the climber-type students. As the representative of climber-type students, at the three preliminary stages they tend to perform the assimilation thinking process. These students even also perform the assimilation thinking process in the looking-back stage (Yani et al., 2016).

CONCLUSION

The camper-type students have assimilation thinking process in understanding problem and planning problem solution, accommodation-assimilation thinking process in executing problem solution, and also accommodation thinking process in looking-back at their answer. On the other hand, the camper-to-climber-transition-type students have similar thinking process with that of camper-type students during the written test in understanding problem, planning problem solution, and executing problem solution. However, in looking back at their answer the camper-to-climber-transition-type students have accommodation-assimilation thinking process from both the test item response and the interview response. It would be nice if the future research attempts to investigate a kind of thinking pattern for people with AQ of each type in solving problems, such as in the form of a profile of mathematical problem-solving abilities in terms of the types of AQ.

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