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Student's Creative Thinking Process about Numeracy: A Case of Student's Adversity Quotient (AQ)

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ABSTRACT

The study aims to describe the creative thinking process of junior high school students with different Adversity Quotient (AQ) categories (quitter, camper, and climber) in solving numeracy problems. This qualitative research involves three subjects representing distinct AQ categories. Data collection includes the ARP questionnaire, numeracy problem-solving tests, and interviews, with analysis using the Pierce sign concept. Findings reveal camper and climber subjects effectively separate information in the ideation stage, while quitter and climber subjects associate knowledge concepts in generating ideas. In preparing a plan for application, camper and climber subjects strategize based on information and knowledge, while in applying an idea, quitter subjects surrender, campers choose easier alternatives, and climbers persist with pre-planned strategies. Results suggest that tailored motivation according to students' AQ categories can enhance teacher-student engagement.

***Keywords**: creative thinking process, problem-solving, numeracy, adversity quotient.*

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INTRODUCTION

Creative thinking is one of the abilities that must be had by individuals in the 21st century because it affects the success or failure of the individual. In the academic context, students are focused on skills such as critical thinking, creative thinking, and problem-solving (McGregor, 2007), but the situation at this time shows that efforts to improve creative thinking in mathematics are still rare and have not yet become the focus of attention and in some situation schools often limit students' creativity by limiting their imagination (Munandar, 1977; Siswono, 2008).

Creative thinking is one of the highest levels of thinking (Krulik & Milou, 2014). Creative thinking in mathematics is a mental activity by an individual when they find a problem to solve, make a decision, or satisfy a curiosity (Ruggiero, 2011). Creative thinking is an activity of producing a new idea based on current knowledge, or by using other knowledge but still in line with existing rules and procedures (Csikszentmihalyi, 1997). Creative thinking is a process of generating or creating new ideas by an individual, where the new idea is a combination of existing ideas or ideas that have never been realized (Innovation, 2001). So, creative thinking in this research is the activity of an individual to find or generate ideas from experience or knowledge that has been obtained by still considering the existing rules and procedures.

The thinking process is a step in having the data received, processed, and stored in memory, then if one day the data needs to be processed again, it can be recalled from memory. The steps of the creative thinking process are: synthesizing ideas, generating ideas, preparing a plan for application, and applying an idea (Siswono, 2016). Synthesizing ideas means that an individual will collect all ideas that come from their previous knowledge and experiences in daily life, at this stage, an individual already understands the problem and has some knowledge that is needed in solving the problem. Generating ideas means that an individual can produce more than one idea related to the problem as a result of synthesizing ideas. Preparing a plan for application means that an individual has chosen one of several ideas that have been generated previously to be used in solving the problem, and applying an idea means that an individual has used the previously chosen idea in solving the problem (Siswono, 2016).

The process of learning mathematics is always related to a problem, on the other side problem solving is the main goal of the educational program (Dahar, 2011). Creative thinking skills can be improved by problem-solving activities. An individual will do a thinking process when they solve a problem until a solution is found, this is because, with a problem, the brain will be practicing information (Briggs & Davis, 2008; Puspitasari & Sulaiman, 2019).

Numeracy is a quantitative reasoning ability possessed by an individual where it is needed in daily life. Numeracy is often known as a person's ability to define and use numbers directly in their lives (Askew et al., 2004; Steen, 2002). Numeracy refers to the knowledge and skills in using many types of numbers and symbols in basic mathematics to solve practical problems in daily life situations, analyze information that is presented in different forms, such as graphs, tables, maps, etc., and apply interpretations to make predictions and decisions. These numeracy skills are

very important for students, as they are related to the ability to solve mathematical problems in everyday contexts (Pangesti, 2018). Numeracy skills help individuals to have sensitivity for data presentation, patterns, and number lines and also train their reasoning to solve problems. Train reasoning to solve problems (Sri, 2017).

The creative thinking process and numeracy problem-solving skills of each individual are different from each other so the challenges encountered by each individual will also be different. Stoltz (2000) in his research concluded that an individual has intelligence in handling difficulties, which is known as Adversity Quotient. AQ is designed to measure an individual's response method to unfortunate situations (Nikam & Uplane, 2013). AQ is categorized into three types of personality traits climber, camper, and quitter. Climber is a type of individual who always tries their best throughout their life to achieve success. Camper is the type of individual who prefers to try to deal with challenges but eventually, they will give up at a certain point. A quitter is a type of individual who chooses to give up in front of all the difficulties that are occurring (Stoltz, 2000). Based on the description above, the writer will describe the creative thinking process of junior high school students with AQ climber, camper, and quitter categories in solving numeracy problems.

METHOD

This research is a descriptive qualitative. The data sources in this study are ninth-grade students in one of the junior high schools in Kediri district. The research subjects will be selected using purposive sampling with maximum variance, the subject taken is one different student in each AQ category including climber namely Ani, camper namely Rara, and quitter namely Dea student in which all three are female because they are considered to be able to communicate better, have relatively similar mathematics abilities based on references from mathematics teachers seen from the average report score, and can explain all things related to their ideas while solving numerical problems with numerical problems well.

This research uses two instruments, which are the researcher as the main instrument and three types of data collection techniques, an Adversity Response Profile (ARP) questionnaire, numeracy problem-solving test, and interview guidelines as supporting instruments. The first type of data collection technique is the Adversity Response Profile (ARP) questionnaire adopted from Sudarman's (2011) research, then there is a problem-solving test consisting of one numeracy problem in the form of a description problem and must be completed within 30 minutes,

Last week Mr. Ali had a vacation to Batu City and stayed at a villa. During the week in the villa, Mr. Ali's children were very happy to swim.

Knowing that Mr. Ali plans to make a swimming pool in his house with the same volume capacity as in the villa. It is known that the ratio of length, width, and depth of the pool in the villa is 4:2:1. Determine at least two pool shapes and pool sizes that Mr. Ali can make! (Show the calculation of each volume) and the last one is an interview guideline.

<table>
<tr><td colspan="4">Synthesizing Ideas</td></tr>
<tr><td colspan="4">• Students begin to understand the given problem
• Students identify information about ratio and volume
• Students begin to collect all their knowledge about various types of spaces, and formulas for calculating volume and solving the ratio problem.
• Students explain the ideas that come to their mind to be used in solving the problem
• Students explain how the idea that came to mind was found.</td></tr>
<tr><td>Questions</td><td>Mental Activity</td><td>Ways of Thinking</td><td>Ways of Understanding</td></tr>
<tr><td>1. Read the question first, can you understand it?
2. What information can you identify from the question?
3. What does the question have to ask?
4. What ideas currently come to your mind to solve the problem? Explain it!
5. How did you get the idea you thought of?</td><td>Synthesizing (identify any form of information)</td><td>Reding carefully</td><td>Marking keywords</td></tr>
<tr><td colspan="4">Generating Ideas</td></tr>
<tr><td colspan="4">• Students can construct some strategy from the ideas that came to mind in the previous stage</td></tr>
<tr><td>Questions</td><td>Mental Activity</td><td>Ways of Thinking</td><td>Ways of Understanding</td></tr>
<tr><td>6. From the information you have and the ideas you have thought of, how do you construct a strategy to solve the problem? Let's explain one by one</td><td>Strategize (based on synthesized ideas)</td><td>Silence, thinking</td><td>Geometric drawing</td></tr>
<tr><td colspan="4">Preparing a Plan for Application</td></tr>
<tr><td colspan="4">• Students can choose the strategy that they think is easiest but still accurate in solving the given problem.
• Students can explain the first step they took in solving the problem</td></tr>
<tr><td>Questions</td><td>Mental Activity</td><td>Ways of Thinking</td><td>Ways of Understanding</td></tr>
<tr><td>7. Which one of the strategies do you think is the easiest?
8. Why do you think that strategy is the easiest?
9. What is the first step of the strategy you have chosen?</td><td>Formulate the implementation of the chosen strategy (in steps)</td><td>Sketch on paper</td><td>Geometric drawing</td></tr>
<tr><td colspan="4">Applying an Idea</td></tr>
<tr><td colspan="4">• Students have found the result of the strategy they have chosen.
• Students prove that the result obtained is the same as the request in the problem
• Students try to show the same answer with a different strategy (if any)</td></tr>
<tr><td>Questions</td><td>Mental Activity</td><td>Ways of Thinking</td><td>Ways of Understanding</td></tr>
<tr><td>10. From the strategy you chose,</td><td>Proving (getting</td><td>Practice</td><td>Final answer (in</td></tr>
</table>

how did you get the result? Is it in agreement with what is requested in the problem? 11. If using another strategy that you did not choose, would the result be the same or different? Please try to show me	results from the strategy that has been applied), thinking about the possibilities of using a different strategy		the shape of geometric figures and calculations)

RESULTS AND DISCUSSION

Climber Students' Creative Thinking Process

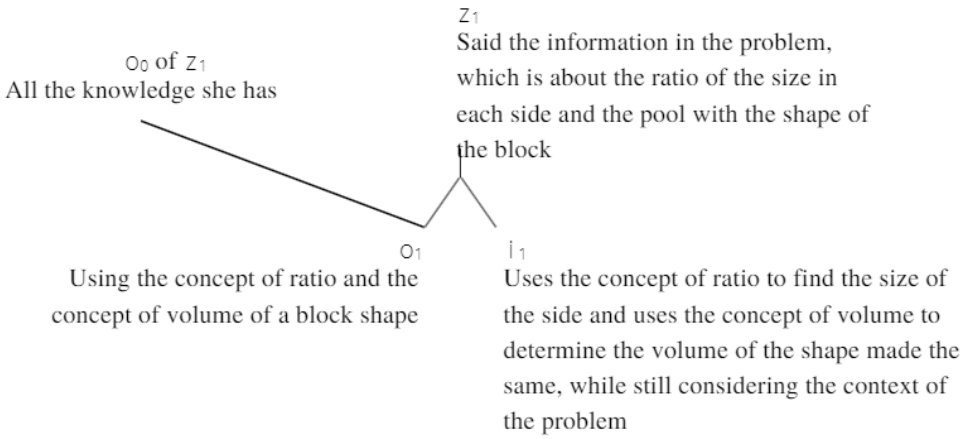

Figure 1. Diagram of Ani's Synthesizing Idea Stage Analysis

From z_1, it can be seen that Ani has understood and noticed the problem in the form of context, the mathematical object about I_k is "using the concept of ratio and the concept of volume of a block" and the interpretant space found is that Ani will use the concept of ratio to find the size of each side on the known block. ratio concept to find the size of each side of the known block building then use the volume formula to make sure that if the size of the shape he makes is different, it will still have the same volume. she did this by still seeing the context of the problem, which is about the shape of the swimming pool.

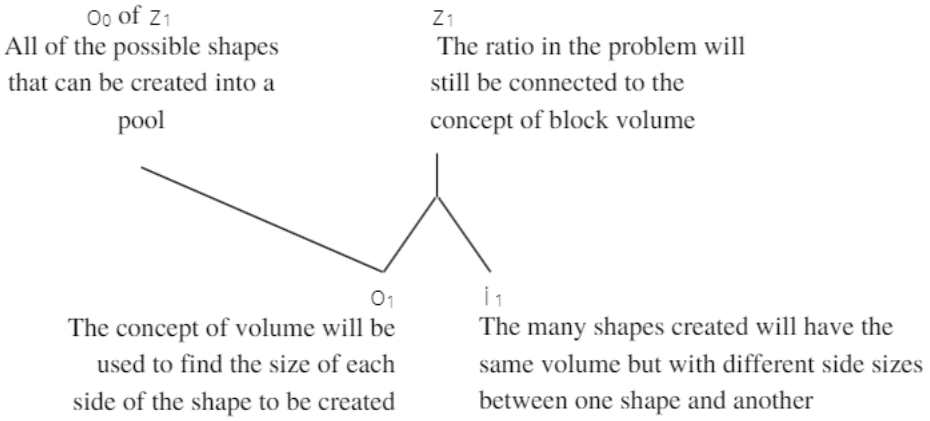

Figure 2. Diagram of Ani's Generating Idea Stage Analysis

From z_1, it can be seen that Ani made a specific size based on the known ratio in the problem that will then be connected to the concept of the volume of a block. Math object o_1 about I_k is "the concept of volume is used to find the size of each side of the shape that will be made" when Ani solves the problem. The interpretant space obtained is the types of shapes that will be made by Ani will always have the same volume with a different size of each side is different from one shape to another.

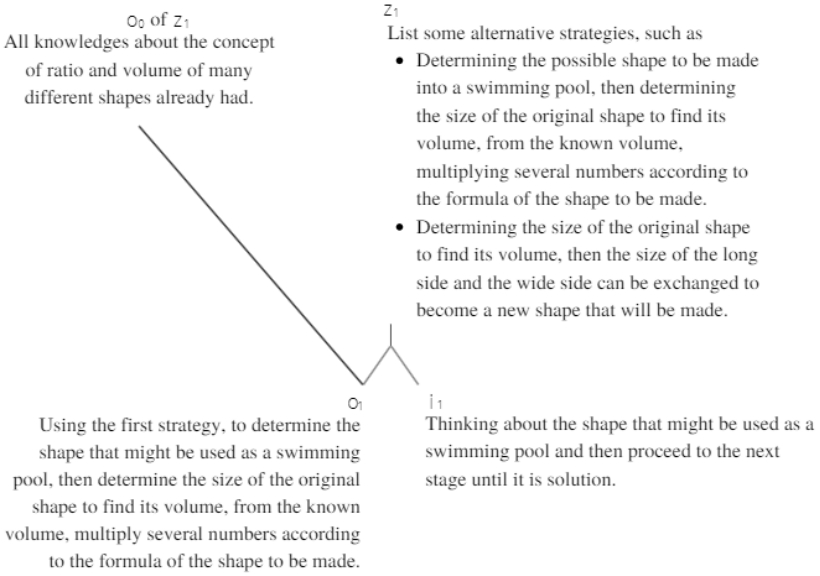

Figure 3. Diagram of Ani's Preparing a Plan for Application Stage Analysis

From z_1, it was known that Ani had described the two alternative strategies that she had thought of. Ani felt doubt if only exchanging the length and width can be said to have different sizes and then Ani will start to take the first step, which is to think about the possible shapes that can be realized to become a swimming pool, this is also known as the interpretant space.

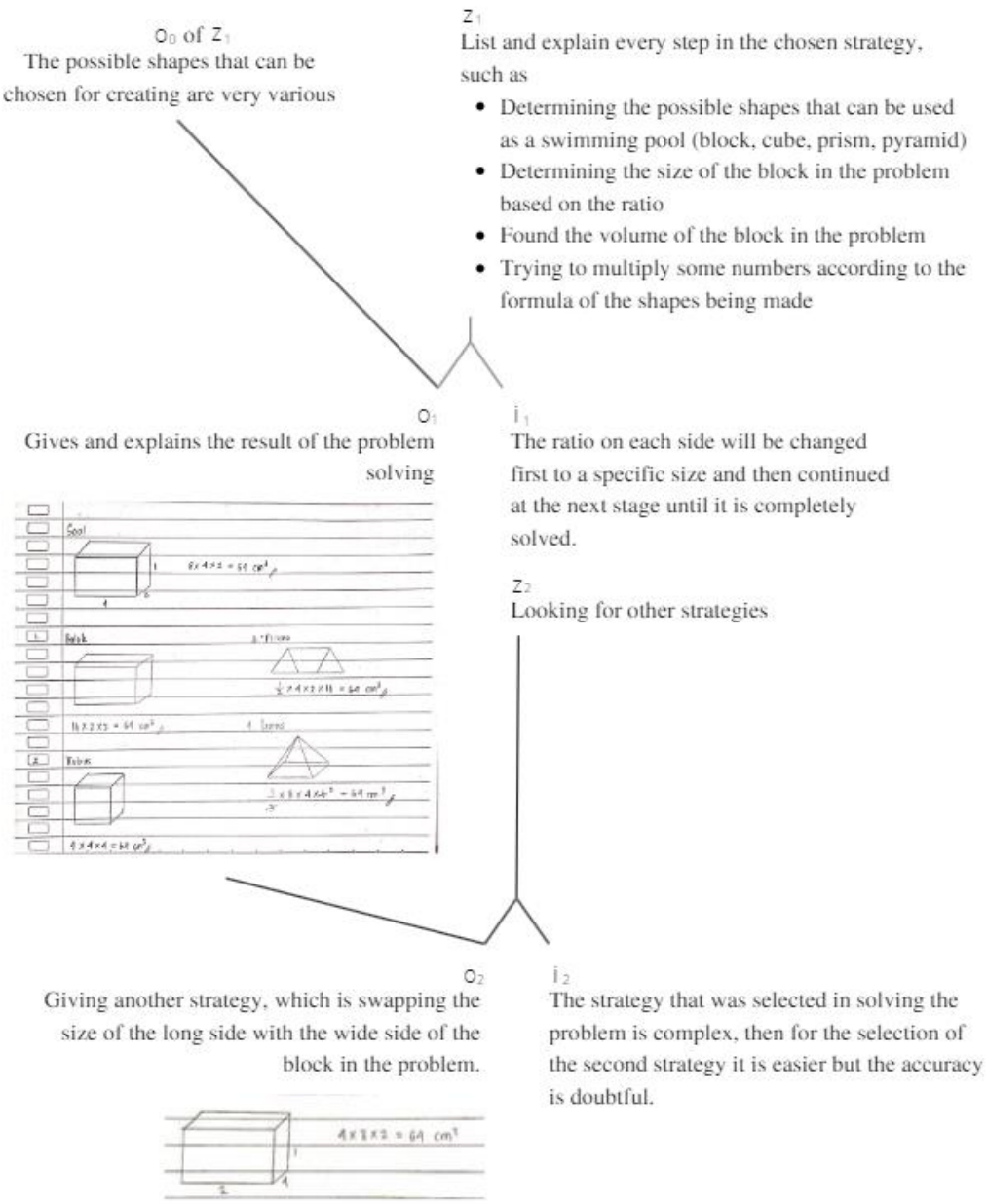

Figure 4. Diagram of Ani's Applying an Idea Stage Analysis

From z_1 = "list and explain every step in the chosen strategy", it is known that Ani has explained in detail step by step what she will do in solving the problem based on the strategy she has chosen before. After Ani explains the results of the problem-solving she did, z_2 will be given and the results of the two strategies given are both correct, the interpretant space of o_2 shows that Ani always tries to give the best solution results even though the stages of the strategy are complex.

Camper Students' Creative Thinking Process

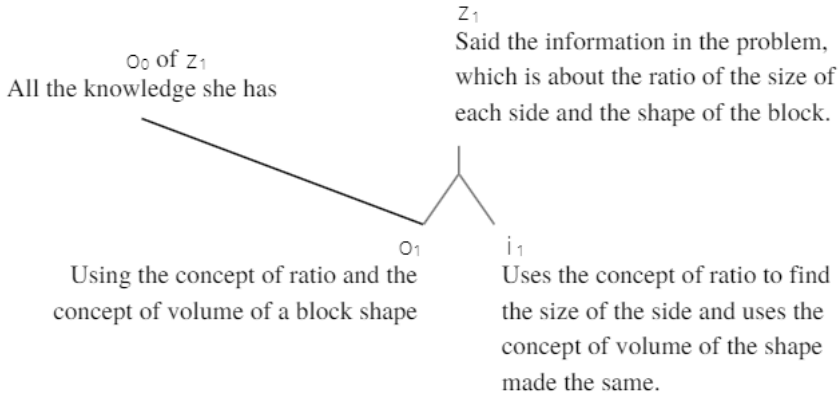

Figure 5. Diagram of Rare's Synthesizing Idea Stage Analysis

From z_1, it can be seen that Rara understands the problem. Then it is known that the mathematical object of I_k she gets from her knowledge is based on learning experiences in the class. The interpretant space obtained is that Rara will use the concept of ratio to find the size of each side of the known block and then use the volume formula to make sure that the size of the block that she makes is different, but it will still have the same volume.

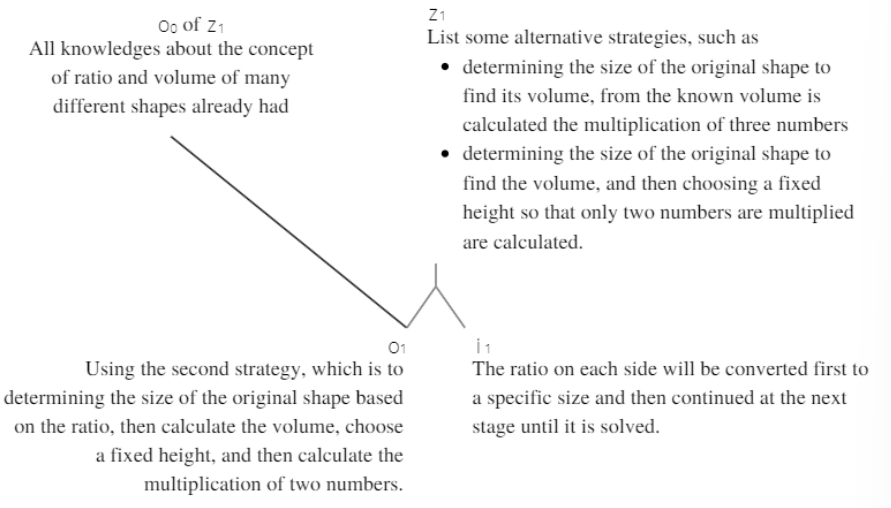

Figure 6. Diagram of Rare's Preparing a Plan for Application Stage Analysis

From z_1, it can be seen that Rara has described the two alternative strategies that he thought of. Although it looks similar, in the end, the mathematical object I_k obtained is "the second strategy is the easiest" because Rara feels that she only needs to try multiplying two numbers. Next, Rara will start to take the first step, which is to determine the size according to the ratio in the problem, this is included in the interpretant space.

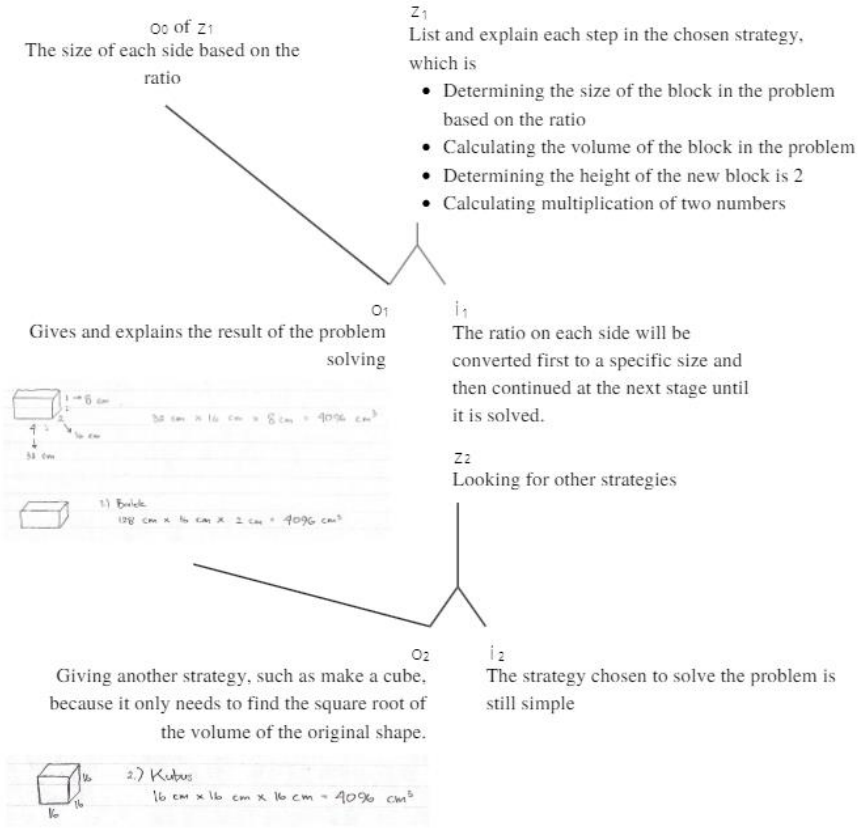

Figure 7. Diagram of Rare's Applying an Idea Stage Analysis

From z_1 Rara has explained in detail the step by steps that she will do in solving the problem based on the strategy that she has chosen before. After Rara explained the results of his problem-solving, z_2 = "looking for other strategies" because, at the plan for application stage, Rara mentioned two strategies. But it turns out that in the math object o_1 about I_1 Rara gives another alternative strategy. The results of the two strategies given are both correct, but the interpretant space obtained from o_2 is Rara easy to give up.

Quitter Students' Creative Thinking Process

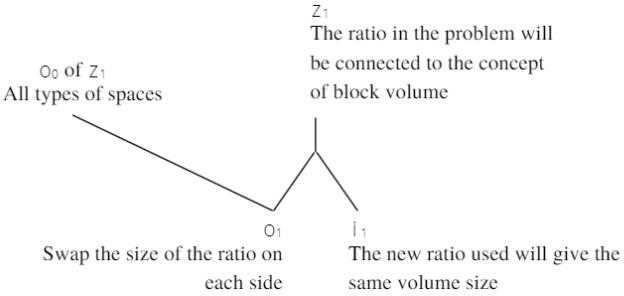

Figure 8. Diagram of Dea's Generating Idea Stage Analysis

From z_1, it can be seen that Dea did not make a specific size but used the ratio on each side as the size of the new building. the ratio on each side as the size of the new shape that she will create. Besides that, at this stage, Dea

only focused on block shapes even though the object o_0 from z_1 was known to be all types of spaces. So that the interpretant space is obtained, that is by exchanging the ratio, then the volume resulting from all the shapes will be the same even though the size of each side in the end between one shape and another.

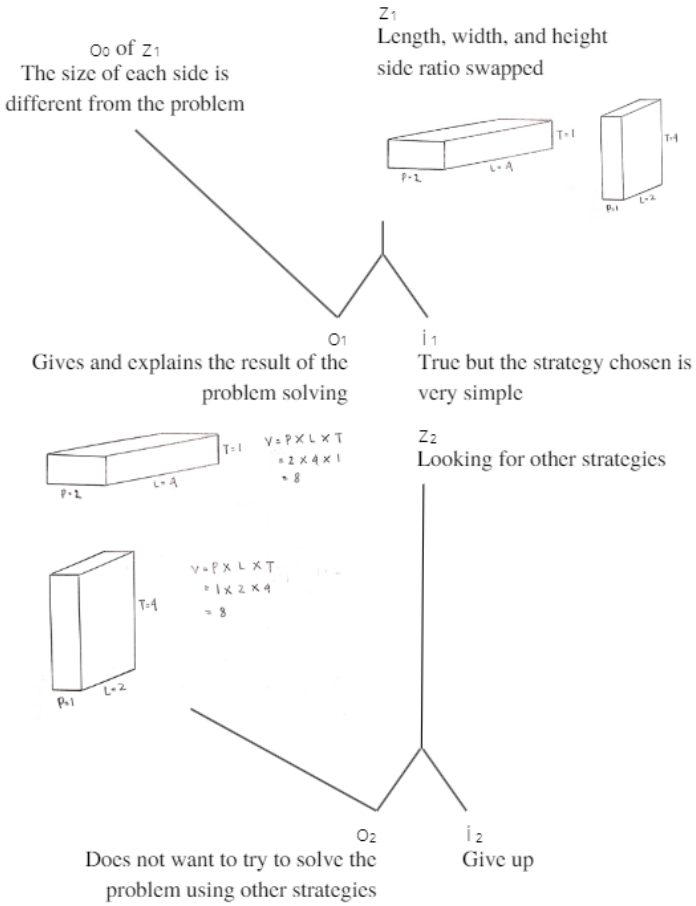

Figure 9. Diagram of Dea's Applying an Idea Stage Analysis

It can be seen that Dea here does not think of other strategies and has confidence that the strategy she chose is the easiest and correct so that the interpretant space of o_2 is Dea considered to have given up.

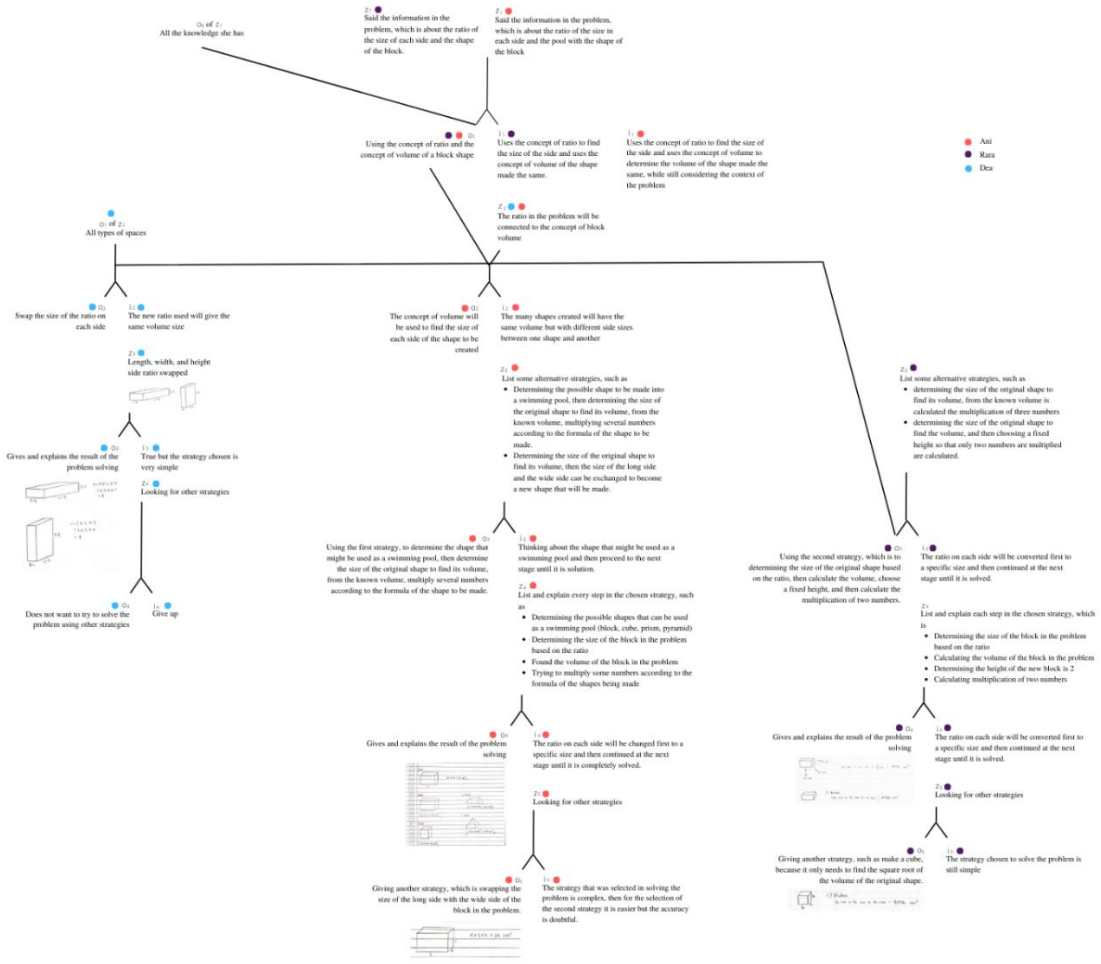

Figure 10. Summary Diagram of Whole Stage Analysis by Ani, Rara, and Dea

Based on the results, it is known that when working Dea did not do sketching activities but then Dea did reflection activities which seemed meaningless because afterward she did not do further work and chose to stop. From z_4 "looking for other strategies" and o_4 " does not want to try the problem using other strategies" it can be concluded that Dea wants to answer the problem in the easiest way possible and does not want to try other ways. It is often found that quitter students prefer to refuse when meeting challenges so they have no enthusiasm when given a problem (Hidayat & Sariningsih, 2018).

Another observation is the findings that in subject Ani, through z_3 "List some alternative strategies, such as determining the possible shape to be made into a swimming pool, then determining the size of the original shape to find its volume, from the known volume, multiplying several numbers according to the formula of the shape to be made or determining the size of the original shape to find its volume, then the size of the long side and the wide side can be exchanged to become a new shape that will be made." and o_4 in the form of the result of problem-solving, it can be seen that Ani also considers the context when solving the problem. This is not practiced by quitter or camper students. It can be seen in o_3 "Using the first strategy, to determine the shape that might be used as a swimming pool, then determine the

size of the original shape to find its volume, from the known volume, multiply several numbers according to the formula of the shape to be made." It can be seen that in solving problems, Ani chose a complex strategy and ignored the second strategy because even though it was easier he was doubts about the accuracy. Climber students will always try to solve a problem that has been given (Suhartono, 2017). (Stoltz, 2000) research also argues that climber students have a gigantic nature. and that climber students are persistent, resilient, steadfast, and always work hard.

Then, the Rara subject gave the blocks and cubes with the reasons given in o_4 in the interview analysis diagram, it can be seen that Rara chose the easiest way to solve the problem. which gives the same shape as the problem. Even though when looked at z_3 " List some alternative strategies, such as determining the size of the original shape to find its volume, from the known volume is calculated the multiplication of three numbers or determining the size of the original shape to find the volume, and then choosing a fixed height so that only two numbers are multiplied are calculated." then multiplication of two numbers is sought only" then z_5 "looking for other strategies" and o_5 "Giving another strategy, such as make a cube because it only needs to find the square root of the volume of the original shape." It can be seen that Rara is productive enough in coming up with ideas and can use other strategies, but in the end, a different strategy was chosen, especially for the cube. with the reason being that he considered it easy. This is in accordance with Stoltz's (2000) research where it is said that camper students will quickly feel satisfied when solving problems. So even though he can use other strategies, Rara prefers the building he considers the easiest. When Rara solves the problem, she often double-checks because she doubts the results of her work. This is due to students who are classified as very creative in solving problems using their imagination and also their instincts and linking knowledge with one another (Johnson, 2002). Another observation is that when Dea solves the problem, she often repeats the shape she draws and writes the size on each side. This is by research by (Stoltz, 2000) where quitter students when they meet a challenge will find it more difficult to control their emotions which will have an impact on the results of their work.

CONCLUSION

The results showed that climber students carry out the creative thinking process at the stage of synthesizing ideas, which is by marking and rewriting information that is considered important, and paying attention to the context, at the stage of generating ideas is done by connecting the concept of knowledge that she already has with knowledge in the book, then at the stage of applying an ideas is done by trying to provide another strategy that is considered easier. the stage of preparing a plan for application is done by giving two drafts of the solution strategy that she will use complexly based on information and knowledge that has been obtained before, and the stage of applying ideas is done by giving proof of the problem solving she did using two different strategies with the same final answer while still considering the context. Camper students carry out a creative thinking process at the stage of synthesizing ideas by separating information that is considered important and less important even though they do not pay attention to the context of the

problem, at the stage of preparing a plan for application by giving a design that connects important information that has been obtained with the concept of knowledge that she has before in a simple way, then at the stage of applying ideas is done by trying to provide another strategy that she considers easier. Quitter students carried out a creative thinking process at the generating idea stage by connecting the concept of knowledge that she only had before that concept was related to the problem that was presented, then at the stage of applying an idea she decided to give up rather than try another strategy.

The results showed that the camper subject in the stage of synthesizing ideas is less concerned about the context and at the stage of applying ideas still chooses the strategy that is considered the simplest, so that a teacher can provide more problem-solving exercises related to everyday life. Then quitter subjects in the stage of applying ideas were less enthusiastic in exploring their ideas, so a teacher can provide more motivation to each student with AQ quitter. Other researchers, can ask other questions that have not been asked so that students' creative thinking processes can be known in more detail.

REFERENCE

Askew, M., Millett, A., & Brown, M. (2004). The impact of the National Numeracy Strategy in Year 4:(1) Learning. *Research In Mathematics Education*, *6*, 175–190.

Briggs, M. J., & Davis, S. (2008). *Creative Teaching: Mathematics in the Early Years and Primary Classroom*. Routledge.

Csikszentmihalyi, M. (1997). *Creativity: Flow and the psychology of discovery and invention*.

Dahar, R. W. (2011). *Teori-Teori Belajar Dan Pembelajaran*. Bumi Erlangga.

Hidayat, W., & Sariningsih, R. (2018). Kemampuan Pemecahan Masalah Matematis dan Adversity Quotient Siswa SMP melalui Pembelajaran Open Ended. *Diterima: 16 Maret*, *2*(1), 109–118.

Infinite innovation. Ltd. 2001. (2001). *Creativity and Creative Thinking*. Http://Www.Brainstorming.Co.Uk/Tutorials/Tutorialcontents.Html.

Johnson, E. B. (2002). Contextual Teaching and Learning: What It Is and Why It Is Here to Stay. *Corwin Press, Inc., Thousands Oaks.*

Krulik, S., & Milou, E. (2014). *Teaching Mathematics in Middle School A Practical Guide*. MA: D.C. Keath and Company.

McGregor, Debra. (2007). *Developing thinking ; developing learning : a guide to thinking skills in education*. McGraw-Hill.

Munandar, S. C. U. (1977). *Creativity and education: A study of the relationships between measures of creative thinking and several educational variables in Indonesian primary and junior secondary schools*. Doctoral dissertation, Universitas Indonesia.

Nikam, V. B., & Uplane, M. M. (2013). Adversity quotient and defense mechanism of secondary school students. *Universal Journal of Educational Research*, *1*(4), 303–308.

Pangesti, F. T. P. (2018). Menumbuhkembangkan Literasi Numerasi pada Pembelajaran Matematika dengan Soal HOTS. *Indonesian Digital Journal of*

Mathematics and Education, 5, 566–575.

Puspitasari, R. D., & Sulaiman, R. (2019). The Profile Of Students' Thinking in Solving the Tasks of Mathematical Induction Seen from Mathematical Ability. *Jurnal Ilmiah Pendidikan Matematika, 8*(2).

Ruggiero, V. R. (2011). *The Art of Thinking: A Guide to Critical and Creative Thought* (7th ed.). Pearson/Longman.

Siswono, T. Y. E. (2008). *Promoting Creativity in Learning Mathematics using Open-ended Problems*.

Siswono, T. Y. E. (2016). *Proses Berpikir Kreatif Siswa dalam Memecahkan dan Mengajukan Masalah Matematika*.

Sri, W. (2017). Ideal Mathedu of Mathematics and Education. *Indonesian Digital Journal of Mathematics and Education*, *3*(5), 285–295.

Steen, L. A. (2002). *Quantitative Literacy: Why Numeracy Matters for Schools and Colleges*.

Stoltz, P. G. (2000). *Adversity Quotient : Turning Obstacles into Opportunities*.

Suhartono, S. (2017). *Adversity Quotient Mahasiswa Pemrogram Skripsi* (Vol. 5, Issue 2).