



Critical Thinking Ability in terms of Adversity Quotient on DAPIC Problem Solving Learning

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Abstrak

The research aims to describe the level of students' critical thinking ability based on three categories of Adversity Quotient in DAPIC (Define, Asses, Plan, Implement, and Communicate) Problem Solving learning. The research method is descriptive qualitative research. Sampling technique used purposive sampling method and based on three categories of Adversity Quotient, namely quitter, camper, and climber. The research subjects were seven students of class VIII B State Junior High School 3 Sindang Indramayu. Data collection used five questions of critical thinking ability, 30 items of adversity quotient questionnaire, and triangulation to check data validity. Data analysis techniques are data reduction, data presentation, and conclusions. The results showed (1) critical thinking ability of the quitter students had been completed by four indicators; (2) critical thinking ability of the camper students has completed five indicators but does not solve them correctly and; (3) critical thinking ability of the climber students has completed five indicators correctly.

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INTRODUCTION

In the 21st century, the development of the times and technology demanded the field of education to experience rapid development. Quality education produces quality human resources too. The learning process is key to developments in the field of education. Students are required to have critical thinking skills in learning, including in mathematics learning so that classroom mathematics learning experiences rapid development in learning. Mathematics underlies modern developments that have an important role in developing human thinking, and are a useful communication tool to train critical, logical, creative, and innovative thinking (BSNP, 2006; Haryati, Suyitno, & Junaedi, 2016).

Critical thinking ability are needed in mathematics learning so students are able to overcome mathematical problems that tend to be of nature abstract. Rochmad, Kharis, & Agoestanto (2018) say critical thinking ability enable students to learn and solve problems systematically. One of the main objectives of learning is to improve the ability to think critically, make rational decisions, about what is done and believed (Nur & Wikandari, 2010; Shanti, Sholihah, & Abdullah, 2018). This suggests that the learning process really requires critical thinking ability.

The 2013 curriculum reapply the importance of critical thinking ability that are aimed to make students start thinking critically in every subject in the school. In mathematics learning, it is important that students have critical thinking ability, but the facts show that this has not yet fully materialized. The results of the Trends in the International Mathematics and Science Study (TIMSS, 2015) show that the ability of Indonesian students both fact and procedural is still low, especially the critical thinking ability of Indonesian students are still in 44th position out of 46 countries surveyed.

There needs to be a change in the learning process of mathematics in Indonesia, especially the efforts of teachers to develop students' critical thinking ability in solving problems related to math problems. Problems in learning can be a trigger and followed by question "solve questions in various ways", "asking questions", "what wrong", and

"whats to do" can occur when students think critically. Delina, Afrilianto, & Rohaeti (2018) stated critical thinking ability are needed by students in overcoming various problems in daily life.

Good critical thinking ability make students better at understanding and mastering the mathematical concepts they learn. This situation implies the need for the selection of learning models that are able to develop critical thinking ability. DAPIC Problem Solving is a problem-solving process developed by IMAST and can be used as a mathematical learning model to solve problems. IMAST (IMaST, 1997: 13) states that when students work to explore and solve a problem given in learning process, students have the potential to develop strong critical thinking ability. DAPIC is how students define a problem (*Define*), assess a problem (*Assess*), plan to solve a problem (*Plan*), implement a plan to resolve the problem (*Implement*), and communicate the results of the settlement (*Communicate*).

Problem solving becomes important to foster critical thinking in mathematics. According Zevenbergen, Dole, & Qright (2004) stated problem solving has the greatest effect with activities directly. Problem solving activities can foster the ability can be directly out by students so that it has great benefits for the result obtained. Mafthukin (Taubah, Isnarto, & Rochmad, 2018) revealed that the ability to think critically is an ability that must be done by students in learning mathematics, critical thinking has an important role in the creativity of students.

The ability to think critically requires the students to solve problems for every life challenge they face. Adversity Quotient (AQ) has a role in solving problems. Hartosujono (2015) states that AQ is the ability of how one receives effectively and associates himself with the challenges that exist. AQ helps to solve these challenges and how to overcome them so that they achieve success in their lives. According to Nikam & Uplane (2013), AQ has four components, namely Control (C), Origin and Ownership (O₂), Reach (R), and Endurance (E). The component divides AQ into three categories, namely quitter, camper, and climber. Quitters or students who give up and try to get away from problems, campers or students don't want to take big risks and feel satisfied with their conditions, and climber or students who never give up and have goals (Stoltz,

2000; Sari, Sutopo, & Aryuna, 2016; Ardiansyah, Junaedi, & Asikin, 2018).

Based on the description of the background, the purpose of this study was to describe the level of students' critical thinking abilities based on three categories of Adversity Quotient on DAPIC Problem Solving learning. The benefits of this study are to develop students' critical thinking ability in solving problems based on each category of Adversity Quotient.

METHODS

Research Design

This research was conducted at State Junior High School 3 Sindang Indramayu. The research method is descriptive qualitative research. According to Syaodih Sukmadinata (Suwandayani, 2018) descriptive research is aimed at describing and describing existing phenomena, both scientific and human which pay attention to the characteristics, qualities, interrelationships between activities. Besides that qualitative research, researchers also interact personally with the subject of research to find out things related to how students overcome difficulties (Moloeng, 2005; Haryati, Suyitno, & Junaedi, 2016).

The subjects in this study were class VIII B 2018/2019 academic year consisting of seven students. The research subject was determined through purposive sampling technique. In accordance with the objectives of the study, the research subjects amounted to seven students were determined based on three categories of AQ namely two quitter students, three camper students, and two climber students. Research flow can be seen to Figure 1.

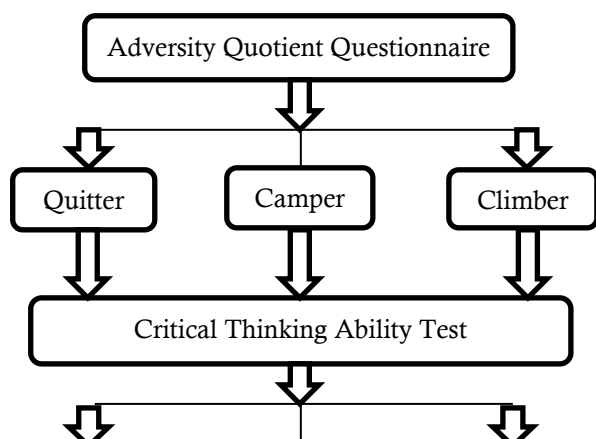


Figure 1. Research Flow

Based Figure 1, the one step of research is Adversity Quotient questionnaire for determine three categories of AQ namely quitter, camper, and climber. The next step is critical thinking ability test for determine three categories of critical thinking namely higher, medium, and low. Interview were conducted to determine Define and analyze to critical thinking ability test based on AQ questionnaire, how are students overcome challenge on problem solving. And the last step is conclusions about how students critical thinking ability are based on AQ.

Data Analysis

The data used in the study are the results of the test data so that the students' questions and answers are the data analyzed. The data collection technique in this study by triangulation is a combination of written tests, questionnaires and interviews. The tests in the form of description questions, AQ questionnaires, and interview, that have been validated by experts. Each subject in the interview was related to the results of his work on the matter of critical thinking ability. While the data analysis techniques used are the validity of the data, data reduction, data presentation, and conclusion (Sugiyono, 2013; Miles & Huberman).

RESULT AND DISCUSSION

Critical thinking is very important in the 21st century, this ability is needed so that students are able to analyze and communicate information obtained. This is in line with the results of the Pacific Policy Research Center (2010) study which revealed that in the 21st century with the existence of technology to access, manipulate, analyze, manage, and communicate information, it requires critical thinking skills. Critical thinking ability helps students adapt to their environment so they can overcome problems that occur.

The indicators of critical thinking according to Angelo (Seventika, Sukestiyarno, & Mariani, 2018) is that the characteristics of critical thinking skills are analyzing, synthesizing, recognizing and solving problems, concluding and judging. Research indicators are interpreting problems, analyzing problems, applying problems, evaluating solutions, and concluding results with evidence.

DAPIC learning is able to make students develop critical thinking ability. The DAPIC stages are interrelated with the ability to think spiritually. During learning carried out with DAPIC Problem Solving learning, students are accustomed to solving problems with the stages of problem-solving so that their critical thinking ability increase compared to the time before the learning takes place. When the students can define (*define*) the purpose of the problem given, it same as students can interpret problems in critical thinking ability, students assess the problem situation it receives (*assess*) the same as students analyze the problems obtained, students can plan (*plan*) how to solve the problem they receive the same as students applying solutions to solve problems in critical thinking ability, students can apply problem solutions (*implement*) that have been discussed together the same as students improve their ability to apply problems and evaluate solutions in critical thinking abilities. According Savitri, Rochmad, & Agoestanto (2013) stated if students choose the method of problem solving appropriately and make mathematical models to solve problems it means students have been able to complete the completion plan correctly. This shows that all stages of DAPIC can develop students' critical thinking ability.

1. Critical thinking ability of the quitter students

Quitters are students who move away from difficult problem solving. How is description of the

quitter students critical thinking ability can be seen in Figure 2.

1) Dik: harga lempeng 140.000 / m²
 P: 28 cm², L: 26 cm², dan t: 10 cm²
 Dit: Berapa biaya yg di keluarkan cm
 untuk membuat atap tsb.

$$\text{Luas lempeng} \left(2 \cdot \frac{1}{2} \cdot a \cdot t \right) + (P_1 \cdot L_1) + (P_2 \cdot L_2)$$

$$\text{Luas lempeng} \left(2 \cdot \frac{1}{2} \cdot 26 \cdot 10 \right) + (28 \cdot 10) + 26 \cdot 28$$

$$\text{Luas lempeng} = 260 + 280 + 728$$

$$\text{Luas lempeng} = 1268 \text{ cm}^2$$

$$\text{Luas lempeng} = 0,1268 \text{ m}^2$$

Biaya
 Biaya = Luas lempeng × harga lempeng
 Biaya = 0,1268 × 140.000
 Biaya = Rp 17.752.000

Figure 2. Results of Quitter Subject

Based Figure 2 discusses answers to quitter studentson indikator of critical thinking ability as follows.

Interpreting problems

The subject of quitter in the stage of interpreting the problem in the question can write or mention what is known and asked in the question incorrectly. The quitter subject can interpret the problem in several ways, namely 1) mentioning the information used to find the right problem solving; (2) rewrite what is known and asked in the right questions even though some quitters are incorrect but they write down what is known and asked in the question. Stoltz (2005) stated that quitter subjects in the interpreting stage only work enough to solve problems. This is contrary to the results obtained that students are able to identify the problem well.

Analysis of the problem

The quitter subject in analyzing the problem in the problem can write the formula or the way to solve it correctly. The quitter subject designs and applies strategies to find solutions to the problems he receives. The quitter subject explains the design or steps that will be used to solve the problem by writing the formula to be used, however, some quitter subjects are less precise in analyzing the problem.

Applying Solution

Quitter subjects can apply the problem well in solving problems, the subject can present a sequence of steps to resolve correctly and lead to incorrect answers. The subject does not correctly link the problems of everyday life with an abstract context, the subject is only able to analyze the problems obtained but in applying the problem the calculation is done less carefully so that the results obtained are not right. This is consistent with the opinion of Stoltz (2005) saying that quitters tend not to accept challenges, tend to avoid tough challenges.

Evaluating Solution

Quitter subjects can evaluate solutions well to solve subject problems, can use certain procedures correctly and incorrect answers. Quitters have not been able to understand the problem given so that it provides unclear steps for solving the problem given but the formula used is appropriate, it is just the subject does not subsidize the results obtained properly. The quitter subject resolves the problem not according to the right procedure even though some quitters use the right procedure but the order done is not appropriate. This is in line with Stoltz (2005) 's opinion that quitters work only as modestly.

Concluding the results with evidence

The quitter subject is able to deduce the results with evidence of the problem by simply writing the evidence or the results. Although some quitters write conclusions that they get, but because the answer is not correct, the conclusions produced are not appropriate. Quitter does not explain why the results obtained can solve the problem. This is in line with Chanifah (2013) who said that quitter tried to stay away from the problem, once he saw the difficulties he would step down and not dare to face challenges.

2. Critical thinking ability of camper students

Campers are students who will stop trying to solve problems when they are comfortable with the situation. How is description of the camper students critical thinking ability can be seen in Figure 3.

Panjang = 6,5 m
 Lebar = 4 m
 Tinggi = 3 m
 Mengecat tembok seluas 1 m² membutuhkan cat $\frac{1}{4}$ kaleng
 Kaleng cat yang diperlukan untuk mengecat dgn seluruh dinding?
 * Menghitung luas dinding
 $Lp = 2(lt + pt)$
 $Lp = 2(6,5 + 4)$
 $= 2(10,5)$
 $= 21 \text{ m}$
 . Menghitung bentuk kaleng cat yang
 $n = \frac{L}{\frac{1}{4}} = L \cdot 4 = 21 \cdot 4 = 84$
 . Jadi, Banyak kaleng yang dibutuhkan untuk mengecat tembok adalah 84 kaleng

Figure 3. Results of Camper Subject

Based Figure 3 discusses answers to camper studentson indikator of critical thinking ability as follows.

Interpreting problems

The camper subject, in the stage of interpreting the problem in the questions, can write or mention what is known and asked in the question correctly. The camper subject can interpret the problem in a number of ways namely (1) mention the information used to find the solution to the problem by giving a complete description, (2) rewrite what is known and ask in the question completely. This is in accordance with Widiastuti (2015) that the camper subject mentions and writes information obtained in the questions.

The camper subject in understanding mathematical problems can provide a definition of what is asked quite well. However, some camper subjects still need to understand the problem better to make their critical thinking skills better. This states that the camper subject can understand what is known and asked.

Analysis of the Problem

The camper subject, in analyzing the problem in the questions, can write the formula or method of completion correctly. The camper subject designs and applies strategies to find solutions to the problems he receives. The camper subject explains the design or steps that will be used to solve the problem by writing the formula that will be used, but some camper subjects are less precise in analyzing the problem. This is in line with the opinion of Stoltz (2005) saying

that the camper still has a number of initiatives, a little enthusiasm, and some effort.

Applying Solution

The camper subject can apply the problem well in solving the problem, the subject can present the sequence of steps to solve it correctly and lead to the right answer. Subjects can associate abstract contexts in everyday life so that subjects can apply problems well. In finding answers to some of the problems presented, the camper subject still not careful so that the results obtained are not right with a real solution. This is in line with the opinion of Stoltz (2005) said that campers even though they have gone through various challenges, but they will stop somewhere and feel comfortable there.

Evaluating Solutions

The camper subject can evaluate the solution well to solve the problem. The subject can use certain procedures correctly and incorrect answers. Campers are able to understand the problems given so that they provide a clear step in solving the problems given, but because they are not careful in their solution, campers often reach incorrect answers. The camper subject resolves the problem not according to the right procedure even though the solution he is working on is in accordance with the problem to be resolved.

Concluding the results with evidence

The camper subject is able to conclude the results with evidence of the problem well. Although some campers still cannot conclude the results properly, they tend to write the evidence or the results without writing down the conclusions they obtained. Campers assume that when they have completed a problem, their assignments have been completed so there is no need to conclude the results so the desired answer is appropriate. This is in line with Mena, Lukito, Siswono (20016) stated that the camper felt quite satisfied that he had reached a certain stage.

3. Critical thinking ability of the climber students

Climber is a students who keeps trying to solve the problem he gets. How is description of the climber students critical thinking ability can be seen in Figure 4.

Diket : alas kubus pertama = 64 cm^2
 panjang rusuk kubus pertama 40% lebih panjang dari kubus kedua
 Ditanyakan : Tentukan kenaikan volume dan perbandingan volume kubus?
 Jawab :

$$a = 64 \text{ cm}^2 = 8 \times 8$$

$$s_1 = 40\% = \frac{40}{100} \times 8 = 3,2$$

$$s_2 = 8 \left(1 + \frac{40}{100}\right) = 11,2$$

$$\begin{aligned} \text{kenaikan volume} &= V_2 - V_1 \\ &= s_2^3 - s_1^3 \\ &= 11,2^3 - 3,2^3 \\ &= 1404,928 - 32,768 \\ &= 1372,16 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{perbandingan volume kubus} \\ \frac{V_1}{V_2} &= \frac{32,768}{1404,928} \\ &= \frac{1}{42,875} = \frac{1}{43} \end{aligned}$$

jadi, kenaikan volumenya adalah $1372,16 \text{ cm}^3$ dan perbandingannya 1 :

Figure 4. Results of Climber Subject

Based Figure 4 discusses answers to climber students on indikator of critical thinking ability as follows.

Interpreting problems

The climber subject, in the stage of interpreting the problem in the question, can write or mention what is known and asked in the question correctly. The climber subject can interpret the problem in a number of ways namely (1) mention the information used to find the solution to the problem by giving a complete description, (2) rewrite what is known and ask in the question in full. This is in accordance with Chanifah (2013) that the subject of climber can understand the problem and be able to capture the information provided by the questions and can retell by the way of their own language.

The climber subject in understanding mathematical problems, can provide a description of what is being asked quite clearly. This states that the subject of climber can understand what is known and asked smoothly.

Analysis of the Problem

The climber subject in analyzing the problem in the question can write the formula or method of completion correctly. The climber subject designs and applies strategies to find solutions to the problems he receives. The climber subject explains the design or steps that will be used to solve the problem by writing the formula to be used, replacing the variables with known values in the formula. This is in line with Stoltz's opinion (Mena, Lukito, & Siswono, 2016) saying that the climber talks about what can be done and how to solve it. Using the knowledge he has

acquired during learning makes the subject of climber able to master the problem well. The subject is able to associate the problems he receives with the things he has learned. The climber subject is able to apply each step of completion mentioned earlier. Applying the rules of cube volume, beam surface area, pyramid volume, prism volume, the surface area of the pyramid and prism properly and correctly. The subject is able to manipulate the problem well to be able to achieve the resolution of the expected problem. This is in line with Stoltz (2005) stated that the subject of the climber is very fond of challenges and is a thinker for all possibilities.

Applying Solution

The subject of the climber can apply the problem well in solving the problem, the subject can present a sequence of steps to solve it correctly and lead to the right answer. Subjects can associate abstract contexts in everyday life so that subjects can apply problems well. The subject understands the meaning of the problem well so that in applying the problem does not experience any obstacles, the climber can use previously obtained data to resolve the problem. Subject subsidizing things that are known and asked about the problem so that the subject can work on the solution properly.

Evaluating the Solution

The climber subject can evaluate the solution well to solve the subject's problem, the subject can use certain procedures correctly and the right answers. The Climber is able to understand the problems given so as to provide a clear solution to the problem given. The subject is able to finish in a clear order and the answers he gets are right because the climber is trying to solve the problem well.

Concluding the results with evidence

The climber subject is able to conclude the results with evidence of the problem that has been resolved. Evidence or results that have been obtained in solving the problem can be transferred back to the purpose of the problem. The Climber is able to associate what is asked in the problem with the results obtained so that they get the expected conclusions, they try to solve the problem correctly to reach the desired conclusion. The Climber feels confident and

right about the things he gets by giving logical reasons for settlement. This is in line with the opinion of Stoltz (2005) stating that the climber feels confident in something greater than themselves.

CONCLUSIONS

Based on the results and discussion, it can be concluded that DAPIC Problem Solving learning can develop students critical thinking ability in problem solving. The results showed (1) quitter students can master four indicators of critical thinking skills, namely interpreting problems, analyzing problems, applying problems, and concluding results with evidence. Quitter students with high critical thinking skills can master five indicators, but when students evaluate the solution, students are still not careful in answering; (2) camper students are able to master five indicators of critical thinking skills, namely interpreting problems, analyzing problems, applying problems, evaluating solutions, and concluding results with evidence. The camper students have flaws in deducing the results with evidence because the students feel they have enough to get the results obtained. without concluding; (3) climber students are able to master five indicators of critical thinking skills, namely interpreting problems, analyzing problems, applying problems, evaluating solutions, and concluding results with evidence correctly.

The solution to this is that the quitter students examine their answers carefully and students get reinforcement regarding the process of completion and the process of thinking and controlling the concentration of students' minds in solving problems. Familiarize students to deduce the results of their work so that students get the purpose of solving the problem.

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