Improving adversity quotient (AQ) with discovery learning

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Abstract. Adversity Quotient (AQ) is one's ability to survive the difficulty and manage the adversity until it finds the way of its predicament. A person with a good AQ ability can achieve goals by facing difficulties. The role of AQ is important in mathematics learning. The researcher observed the students' AQ, got the student’s average in the medium level. This study uses AQ with stimulation, problem statement, data collection, data processing, verification, and generalization. The purpose of this study is to increase adversity quotient in junior high school eighth-grade student of SMP Muhammadiyah 2 Depok, Yogyakarta. This research was conducted on the mathematics lesson of The Linear Equation System (SPLDV) in the odd semester academic year 2017/2018. This research is a classroom action research using two cycles, each cycle consists of three steps which are conducted in two meetings by using discovery learning. Instruments performed in this study are questionnaires AQ, lesson plan, and student worksheet. After learning with discovery learning, students can increase AQ in each cycle. The student’s average has a high AQ. The results of this study indicate that the learning scenario that designed in each cycle can improve the adversity quotient students.

1. Introduction

Education has an important part of technology advance nowadays. Education is something needed by an individual in anytime and anywhere. Education is also an effort to prepare an individual for the guiding activity, teaching, and training. The design of education cannot be separate from the function and the purpose. It uses as the benchmark of the success in designing the education. The national education system is having renewal time by time. It aimed to fix the quality of education in Indonesia. Education curriculum has changed in several times in order to face the global issues. Teaching cannot be separate from the learning process. Teaching used to guide and facilitating the student to learn, managing the condition to learn, understanding against the way student learn to consider learning philosophy which will be used, the way of learning, approach, and learning method in the classroom [1]. It is similar to stated, learning is a process which is used to guide the student in a certain condition in order to help them reach their learning goals [2]. Learning is a process to acquire a knowledge [3]. A process which can change, build and manage someone’s behaviour. Effective learning is a measure of accuracy in doing something and the time required to complete it, learning will work effectively if students can apply what they learn [4]. Discovery learning is learning through problem solving that is under the supervision of teachers and teachers serves to provide material illustrations for students to learn by themselves [5]. So, it can be concluded the importance of a good Mathematics learning to reach the learning goals.

The learning of interaction process among the students, teachers, and learning resources to share the information. Those three components are the aspects of the learning process. Those functions are to reach the cognitive, affective, and psychomotor area. There are many roles in learning Mathematics, one of them is Discovery Learning. stated, “Discovery Learning is a learning method which forces the
students to ask the question and formulate the answer by their self and conclude the general principle from the simple samples or experiences” [6]. Discovery learning is a type of reasoning where knowledge is gained by formulating and testing allegations through experience [7]. Discovery learning is learning through problem solving that is under the supervision of teachers and teachers serves to provide material illustrations for students to learn by themselves [8]. It is similar to Discovery Learning is a constructivism approach where the students are pushed to discover their own principles [9]. Also uttered that discovery learning is a learning that occurred when the students asked to discover the relation on the given information by their self, thus the material presented indirectly [10]. From those statements, it described that Discovery Learning is a learning method which needed by the students to found the hypothesis in each learning step. In the learning activity, that is Stimulation, Problem Statement, Data Collection, Data Processing, Verification, and Generalization [11].

In addition to that, one of important competency which should be owned by the students in learning Mathematics is never given up. It is related to the character of striving. It is known as Adversity Quotient or shortly called AQ. In the education concept, AQ divided into 3 factors which affected the student’s achievement [12]. It is because AQ is an unyielding or endurance attitude. AQ is important to be owned by the students that they are able to face any problems and the challenges. Even in the class or in the environment. Understanding the AQ is important. AQ is someone’s ability to manage the difficulties which they face every day [13]. And than that a better and deeper understanding of striving concept will give a better comprehension about how the people act against the challenge and the obstacle in life. Indeed, it is a clear indicator of the success in the effort every day [14]. Firstly, AQ has passed cognitive development [15]. The student will learn how to respond or close the many questions from the problem. The experience of the children already developed since they were born, where they can fix or grow it. Based on AQ consists of four dimensions. It often called CO₂RE. CO₂RE is an acronym for those four dimensions [16]. It will determine the striving aspect. The dimensions of CO₂RE which arrange AQ are Control, Origin and Ownership, Reach, and Endurance.

AQ in Mathematics learning can be seen through the student’s response when they are given a question. The student who has a high AQ will assume that it was a fun challenge. They will try to answer it. The student who has a medium AQ will try as hard as they can without a happy feeling. While the student who has low AQ will easily give up, can’t do anything, and do not make an effort to found the answer. There are several factors which cause those things happened. Some of them are there are many students who do not like Mathematics. They assumed that Mathematics is a difficult lesson and bored. Sometimes, the students are obliged to enrol the class. So, it was not surprising if the result was low. The questioners result in grade VIII C SMP Muhammadiyah 2 Depok with the student numbers are 30 showed that 17% students have a high AQ, 60% students have a medium AQ, and 23 % students have a low AQ. That is why, it needs the increasing progress of AQ in Mathematics learning in VIII C SMP Muhammadiyah 2 Depok, Yogyakarta.

The unsatisfactory result and student’s AQ are the final results of the lesson learned. By simplifying Mathematics learning was trusted it can be increased the outcome and student’s AQ. One of learning approach which can facilitate the active learning and increase the AQ is Discovery Learning. Someone who owns a great AQ will do anything to reach their goal, or finish their task maximally [16]. The study of Discovery Learning has 6 steps, those are Stimulation, Problem Statement, Data Collection, Data Processing, and Generalization. On stimulation step, the teacher gives a stimulus by providing the problem. It is a proper way to increase the student’s AQ. The student who has a great AQ will be challenged and the student who has medium and low AQ will motivate on the given stimulus. The study by using Discovery Learning approach helps the students strengthen their concept because it will give a confidence which works while they studying with others. Thus, by using it will facilitate the student in increasing the AQ. Therefore, by applying Discovery Learning approach in Mathematics was expected able to help the students increase their AQ.

Through Discovery Learning, the students found the concept and finish the problem related to the use of the concept through the early stimulus which was given by the teacher then it changed into the complex one. Therefore, it was expected that the students were able to try hard and never give up in learning Mathematics. It means Discovery Learning was expected to be able to increase the student’s AQ and mastery the subject of The System of Two Linear Equations on the Junior High School students of SMP Muhammadiyah 2 Depok, Yogyakarta.
2. Experimental Method

In this research, the researcher used classroom action research method that consists of four steps. Those are planning, action, observing, and reflecting. The object of this research is a private school located in Sleman, Yogyakarta, Indonesia. This research conducted in SMP Muhammadiyah 2 Depok. It conducted in November 2017 at the odd semester year 2017/2018. The subject is the students in VIII C grade of SMP Muhammadiyah 2 Depok with the total number is 30 students. The data source is the students grade VIII C in Junior High School of Muhammadiyah 2 Depok, Sleman, Daerah Istimewa Yogyakarta. Instruments performed in this study are questionnaires AQ, lesson plan, observation sheet and student worksheet. Questionnaire to embrace the student Adversity Quotient. With the number of 60 statements, there are 40 negative statements and 20 positive statements. Assessment in this AQ questionnaire using Likert scale with there are 5 options are Strongly Agree, Agree, Less Agree, Disagree, and Strongly Disagree. Questionnaire AQ is judged only on negative statements because AQ assesses the ability of students in the face of adversity. The maximum score in this AQ is 200. The types of data: Data which has acquired is quantitative and qualitative which consist of: a. the result of the student’s worksheet in a group with the subject The Linear Equation System; b. the result of the test in cycle I and II used to know the increasing of the student’s outcome and AQ; c. the result of observation against the implementation or teaching-learning process. The Indicator of Success: the standard of the success in conducting the classroom action research is when the students are able to master the subject of The Linear Equation System classically. Besides, they are able to reach the minimum score ≥70 and the student who has a great AQ is 10%.

Based the early reflection, this research conducted by several procedures that consist of planning, implementing, observing and evaluating, and reflecting for each cycle. Cycle I consists of the first procedure that is planning. It contains: a. the documentation of student’s mid-term result and student’s learning result; b. conducting pra-cycle by giving the AQ questionnaire to the students to measure the student’s ability; c. making a lesson plan; d. making an observation sheet for the students and the teacher in conducting the class; e. making a cycle evaluation tool to recognize the student’s result and AQ. The next step is Conducting the Performance; was given the subject of The Linear Equation System by explaining the subchapter of The Linear Equation System, embed the making concept of The Linear Equation System, and decide the final result by using the chart. Then, it conducted cycle test I. The third performance is Observing and Evaluating. Things should be prepared are 1. Preparing an observation sheet for the students and the teachers during the learning process of Discovery Learning; 2. Collecting the data and AQ questionnaire. The last performance in cycle I is Reflecting. From the result above, it can be done an analysis of observation sheet and student’s result due to the improvement in the cycle II. Cycle II conducted based on consideration in cycle I.

3. Result and Discussion

Research conducted by Susianita with the title of improvement the ability of mathematical reasoning and self-esteem of junior high school students through discovery learning model. The result of Susianita's research stated that there are differences of students' self-esteem differences in mathematics between students who obtained the model of Discovery Learning and students who received conventional learning. Discovery learning in addition to improving student self-esteem also can increase adversity quotient.

The classroom action research conducted in 2 cycles. Each cycle consists of three meetings. Two of them used to conduct Discovery Learning process and the left one used to test the cycle. Each cycle consists of four actions, those are Planning, Action, Observing and Evaluating, and Reflecting. The given of an action in the first cycle is based on the early reflecting (pre-cycle). Based on the result in pre-cycle, it can be done an action for the first cycle by conducting the Plan. Here, the researcher prepared the instrument of collecting the data, observation sheet, lesson plan, and also consult with the teacher. The implementation of the lesson plan belongs to an Action part. In this part, the teacher conducted the learning process appropriate to the lesson plan. In Stimulation step, the student reminded the teacher. The implementation of the lesson plan belongs to an Action part. In this part, the teacher

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it aimed to get the student’s result and the student’s AQ. The last action cycle I is Reflecting. In this step, the teacher and the researcher discuss to plan the things which prepared for the second cycle.

In the second cycle, the plan conducted based on the consideration and the suggestion in the cycle I. In conducting the learning process, all was done effectively and efficiently that the time will be enough. In addition to that, it also the refinement of the cycle I. The next step in observing and evaluating. The result of the observation in cycle II is better than the first. The result of the evaluating in achieving the learning result increased and reached the target. In the Reflecting step, the teacher and the observer write the important things that should be noticed for the next learning process. It helps to increase the student’s AQ.

From the result in a cycle, I and II acquired the explanation as follows. Mathematics learning that used Discovery Learning approach has done and suit to the plan which written in the first and second lesson plan. The learning process conducted by grouping the students. Each group consists of 4 up to 5 students. The distribution has done randomly, it aimed each group will consist of heterogeneous students. The learning process by using Discovery Learning Approach has done by using several ways. The first is stimulation. In this step, the teacher gave a difficult question for the students.

Figure 1 describes the students who did the stimulation question individually. This step used to prepare learning interaction condition which can develop and help the students in exploring the subject. The stimulation in cycle I have not well-prepared yet because not all of the students understand it. In the cycle II, the stimulation was run well. It was a question of The Linear Equation System which related to the daily life.

The second step is Problem Statement. The giving question where the students work in a group that consists of 4 up to 5 students. They asked to comprehend the problem by identifying the known information and was asked. The third step is Data Collection, where the student collects the information which related to the problem. This step is a process where the teacher helps the students in collecting the information related to the problem in the student’s worksheet. Fourth step that is Verification. The students recheck the acquired data so the final result can be the true problem solver. This step that the students looking for the solution from the step before, found the answer to the problem. It is the Data Processing step where the information will be calculated so, the result will solve the problem.

Figure 2 describes the last step that is Generalization. The students generalize by concluding what was learned before. The research did not only focus on the increasing student’s striving but also to increase the student’s cognitive such as student’s Mathematics result. The result of this research showed that there is the increase of student’s striving from the first condition to the cycle I and from the cycle I to cycle II. On the beginning pre-test, even though some of them belonged to the medium category is
around 120 but there are still seven students who have low striving approximately 23%. After giving an action, on the cycle I the average score increased up to 124 and belonged to the medium category. But, in this condition, there is still one student who belonged low category. This condition has not reached yet the desirable target where the researcher wish there are no students who belonged in low striving category. Therefore, they were given a follow up in cycle II.

Then, in the last cycle II, the students strive average more increased proper to the desired target. But, the score is still in the medium category that is 133. In the cycle I, the target of learning goal have not increased yet. In the last activity, the teacher doesn’t have enough time to guide the students to reflect the subject. It happened because the subject in the cycle I can be the new subject for the first and second meeting. So, the students need more time to finish and it takes a long time. Thus, it did not effective and efficient. In the next action, the students tend to organisable so it can save the time. The result of this classroom action research can be seen from the cognitive aspect that is the increase which is reached by the students. It is seen from the student number who get a high score or at least it was equal to the school’s minimal score that is 70. In the cycle I, as much as 50% students reach the minimal score and in the cycle II, there are 77% students who reached minimal score. The following is successful indicator table of classroom action research to increase student’s AQ.

Table 1. Successful indicator table of classroom action research
Discovery learning activity to increase adversity quotient

<table>
<thead>
<tr>
<th>Variable</th>
<th>Interval</th>
<th>Criteria</th>
<th>First condition</th>
<th>Target</th>
<th>The last cycle 1</th>
<th>The last cycle 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adversity Quotient (AQ)</td>
<td>160 &lt; X ≤200</td>
<td>Advanced</td>
<td>0%</td>
<td>10%</td>
<td>0%</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>133 &lt; X ≤ 160</td>
<td>High</td>
<td>17%</td>
<td>40%</td>
<td>20%</td>
<td>43%</td>
</tr>
<tr>
<td></td>
<td>108 &lt; X ≤ 133</td>
<td>Medium</td>
<td>60%</td>
<td>50%</td>
<td>77%</td>
<td>47%</td>
</tr>
<tr>
<td></td>
<td>80&lt; X ≤ 108</td>
<td>Low</td>
<td>23%</td>
<td>0%</td>
<td>3%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>X ≤ 80</td>
<td>Lowest</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Average = 120</td>
<td></td>
<td>Medium</td>
<td>60%</td>
<td>High</td>
<td>124</td>
<td>133</td>
</tr>
<tr>
<td>Cognitive skill</td>
<td>Achieved</td>
<td>Minimum Criteria of Mastery = 70</td>
<td>0%</td>
<td>70%</td>
<td>50%</td>
<td>77,00%</td>
</tr>
<tr>
<td>Average</td>
<td>Failed</td>
<td></td>
<td>33</td>
<td>70</td>
<td>63</td>
<td>75</td>
</tr>
<tr>
<td>Learning process</td>
<td>Accomplished ≥ 80%</td>
<td>Learning succeeded</td>
<td>.....%</td>
<td>&gt;85%</td>
<td>71%</td>
<td>87%</td>
</tr>
</tbody>
</table>

4. Conclusion
According to the result and the discussion that has explained, so that, it concluded that after two times of cycles, learning which used discovery learning increased student’s AQ. Student’s score average that achieved has increased from the beginning toward cycle 1, and the first cycle toward cycle 2 until advance target. At the first condition, student’s score average is 120 meanwhile at the last cycle 1 it became 124 and at the last cycle 2, it became 133.

5. Acknowledgments
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6. References
[16] Stoltz G P 1997 *Adversity quotient turning obstacles into opportunities* New York: John Willey and Sons