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Problem Solving Skill Seen From Adversity Quotient on Guided Discovery Learning Model With Metacognitive Approach Assisted By Schoology

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Abstract

This research aims to describe problem solving process of students taught by *guided discovery learning* model with metacognitive approach seen from *Adversity Quotient* (*AQ*). This *mixed method* used *sequential explanatory* – an ordering combination from quantitative to qualitative. The population consisted of all VIII Junior High School 13 Semarang. The sample was taken by *random sampling.* This research showed that GDL with metacognitive approach and assisted by *Schoology* was effective to problem solving skill. Furthermore, the description of problem solving skill seen from AQ was varied. It was shown by 19 students categorized *climber* – 13 of them were categorized high problem solving skill students, 4 moderate level students, and 2 poor level students. The *camper* category students consisted of 14 students – 12 of them were categorized high problem solving skill students, 2 moderate level students, and none of them was categorized poor level stuent. The *quitter* category students consisted of the persons – none of them was categorized high but each one of them was categorized into moderate and poor level student.

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INTRODUCTION

Mathematics is a science which becomes the base of mathematics educational development. It emphasizes on the importance of improving students' skills in learning mathematics, one of them is problem solving skill. Fajariah, Dwidayati, & Cahyono (2017) and Warli & Fidiana (in Purwati, Rochmad, Wuryanto, 2018) stated that mathematics problems olving skill of students needed to be developed. It is in line with Branca (in Sayful, 2012), mathematics problem solving skill is the essence of mathematics. Russefendi (2006) also stated that problem solving skill is important in mathematics and not only for their future life in understanding mathematics. It is also important for those who will implement it to other studies. The importance of problem solving skill in learning is stated by *National Council of Teacher of Mathematics* (NCTM).

According to NCTM (2000), mathematics reasoning process covers five main standard competences, they are problem solving skill, reasoning skill, connecting skill, communicating skill, and representing skill (Hesti, 2016). The poor level of problem solving skill in Indonesian learners could be seen from PISA research result (*Program for International Student Assessment*), a study focusing on problem solving, reading, mathematics, and science problems. Findings according to PISA (2015), by involving and measuring problem solving skill, stated that Indonesian students' problem solving skill was on poor level with score 386, ranked 63 from 70 countries. Meanwhile, in the other hand, the standard international score was 490 (OECD, 2016).

Furthermore, TIMMS (*Trends in International Mathematics and Science Study*) showed that Indonesian students were on poor levels of (1) understanding complex information, (2) theory, analysis, and problems solving, (3) utilizing tools, procedures, and problem solving, and (4) investigating (in Supinah and Widdiharto, 2015:32). It was supported by field observation, mathematics daily test result which was frequently not passing the minimum grade – 60, initial skill test of all VIII classes which was under minimum average – 62.6, and 65% of the student existence which had difficulties to answer correctly. It was in line with Mulhamah & Putrawangsa (2016) that during preliminary study, there were many students of Junior High School found to have wrong perception, poor critical thinking, and poor problem solving skill. One of the problems was – students tended to take brief and quickest way to solve problems. Therefore, their problem solving skills were categorized poor even there were still many of them having difficulties to understand the questions.

Level of the students' problem solving skill are different. It is not separated from influential factors, both internal and external factors. Intelligence is an internal factor – the psychological factor influencing learning process. There are also many types of quotients, one of them is *Adversity Quotient* (AQ). It is an intelligence to face difficulty. It helps them increasing their potencies (Sunandar, M.A., Zaenuri, Dwidayati, N.K., 2018). This quotient tells how an individual's perception is during facing difficulties and how they could solve the problems. According to Sumartini (2016), to improve problem solving skill needs an accurate learning model. One of them to improve problem solving skill is *guided discovery learning.*

According to Leo Adhar (2012), representation skill and problem solving skill provided good result and developed positive attitudes toward learning mathematics with *guided discovery* learning model. Sutrisno (2012: 212) stated that learning with guided discovery would provide more chances for students to arrange, process, and organize data given by teachers. Sutrisno, D., Retnawati, H (2017) stated that situation in learning process played important role in struggling to deliver the materials to be easily understood by students. If a teacher could not wilsely select an appropriate approach, then students would not experience comfortable and conducive situation to receive the materials. One of the approach to use is metacognitive. In another word, students' metacognition also plays important role in problem solving activity. It is in line with Anggo in Murwati and Masrukhan (2017). They stated that metacognition is a consciousness about cognition and cognitive regulation of an individual which plays important role to improve problem solving and

learning skill. The students' metacognition could be developed by implementing metacognition (Mawaddah, NE., Kartono, Suyitno, H., 2015). This metacognitive approach, the students are taught how to interpret a problem so that they could describe the mathematics problem with their own language to solve it. (Arvyati dan Maryanti, 2018).

As the information and technology develops, teacher needs to take important role to use it in learning. The use of internet by students should be directed to positive and meaningful thing. One of them could be used to support their education. One of internet media which is an integration of *Social Media* and *Learning Management System* (LMS) is *Schoology*. It facilitates teachers to communicate widely to students. It makes students easier to take role in a discussion and cooperating in group. According to Wardono *et al* (2018), *schoology* is a fun media which is in line with the development of current era. Student will no longer be limited in a classroom and its time allocation. Furthermore, teacher should be able to implement learning methods in the medium to make them undertand better.

The problem formulations were (1) how is the effectiveness of GDL with metacognition approach assisted by *Schoology* seen from AQ in improving problem solving skill? (2) How are the students' problem solving skill with GDL leanring and metacognition approach assisted by *Schoology* seen from AQ within *climber, camper* or *quitter* levels?

This research aims to (1) test effectiveness of *guided discovery learning* model with metacognition approach assisted by *Schoology* toward problem solving skill; (2) to create review about problem solving skill seen from *AQ* in GDL learning with metacognitive approach assisted by *Schoology.*

METHOD

This *mixed method* research was a combination of qualitative and quantitative research (Sugiyono, 2013). The population of the research consisted of VIII graders of public JHS 13 Semarang in academic year 2018/2019. The sample was VIII graders of the school in academic year taken randomly. The data was collected since 25 April – 17 May 2019 in VIII – E classroom as control group taught by *scientific* PBL and VIII – F as experimental group taught by GDL with metacognitive approach assisted by *Schoology.* The subjects were taken from 6 students. Two of them were categorized *quitter,* 2 – *camper,* and 2 – *climber.*

In this research, the author collected data through documentation, questionnaire, interview, observation, and test. Furthermore, the instruments of the research were *Adversity Response Profile* questionnaire, problem solving interview guidelines, and problem solving test. ARP was used to find out AQ category of each student. The criteria of AQ categorization is shown below.

Table 1. AQ Categories

No	AQ Categories	Score Interpretations
1	*Quitter*	40 – 117
2	*Camper*	118 – 160
3	*Climber*	161 – 200

Source: (Stoltz, 2000)

The data was analyzed qualitatively and quantitatively. The quantitative analysis consisted of z, *one sample t,* and *independent t* test. The mathematics skill test analysis was done for each indicator by using Polya problem solving steps. The qualitative data analysis was done by data reduction, presentation, and conclusion.

RESULTS AND DISCUSSION

He learning activity was done within four meetings. Each meeting was assessed by an observer – a mathematics professional teacher. Here are the judgement results towart the implementation of learning taught by GDL model with metacognitive approach assisted by *Schoology.*

Table 2. Observation Result of Learning Implementation

Implementation	Percentage	Categories
Meeting 1	85	Well
Meeting 2	90	Very well
Meeting 3	90	Very well
Meeting 4	95	Very well

Before the implementation, the author gave the questionnaire to experimental group. The questionnaire was validated by experts. The AQ questionnaire was given to experimental group with purpose as the base in categorizing the students based on AQ scores. Then, the group categorization would be as consideration in selecting subjects to be interviewed dealing with problem solving skill. THe result of the questionnaire from VIII of the school could be seen below.

Table 3. Student Categorization based on AQ

Categories	Numbers of students	Percentage
Climber	19 students	54
Camper	14 students	40
Quitter	2 students	6
Jumlah	35 students	100

After promoting the learning, in the final meeting a *post test* was given for both groups. It had purpose to find out effectiveness of learning quantitatively and qualitatively. The used instrument to measure mathematics problem solving skill was an essay test. It was in line with Sugiman & Kusuma (2013) telling that to measure mathematics problem solving skill of JHS students could be done by an essay test. The effectiveness of KPM test analysis result was done by Polya problem solving step. Polya (1973) stated there were four stages: to understand, to plan, to solve, to execute the solution plan, and to recheck.

Nuriyatin and Hartono (2018), good learning is a learning that could maximize the students' experience developments by actively involving them in learning activity. The effectiveness of learning is also a standard in learning. In this research, the effectiveness of the learning quantitatively was done by completeness individual test or passing grade test, classical passing grade test, and improvement test. THe used data in term of passing grade and variance test were *post-test* of the students (Table 4).

Table 4. *Post Test* Result

Class	*Post Test* Average
Control Group	72.63
Experimental Group	78.65

Here are the analysis quantitatively: (1) based on individual passing grade class of experimental group by using *one sample t test* assisted by *SPSS statistics 2.0,* the *Sig.* score (one – tailed) was 0.000. The criterion of the test was - $\boldsymbol{H_0}$ was denied if the *Sign.* score was < 0.05 or in turn (Karunia & Yudhanegara, M.R.). Since the score of *Sign.(one tailed) = 0.000* < 0.05 then H_0 was denied and H_1 was accepted or the average score of the skills during *Guided Discovery Learning* with metacognitive approach assisted by *schoology* could reach the minimum passing grade average score; 2) the proportion test compared the frequency of students passing grade the minimum passing grade on both groups. Based on the calculation, it was gained $\boldsymbol{z_{count}}$ = 1.78 while $\boldsymbol{z_{table}}$ = 1.64. Since $\boldsymbol{z_{count}} > \boldsymbol{z_{table}}$ then H_0 was denied. Thus, it could be concluded that the proportion of the experimental group's passing grade was better than the control group; 3) the average comparative test was used to find out variance of both groups' skills. The test used *SPSS 20* software and *independent sample t test.* Based on the calculation, *Sig (one-tailed*) score was 0.000. The criterion of the test was $\boldsymbol{H_0}$ was denied if the score of Sig.(1-tailed) < 0.05 and in turn. Since the significant score was < α or 0.000 < 0.05 then $\boldsymbol{H_0}$ was denied and $\boldsymbol{H_1}$ was accepted or the skill of experimental group was better.

Based on the explanation, it could be concluded that *GDL* with the approach assisted by *schoology* was effective. It was due to (1) the average score of problem solving for the group taught by *GDL* with metacognitive approach assisted by *Schoology* surpassed the actual minimum passing grade after the initial test – 60; (2) the proportion of the skill for group taught by *GDL* with metacognitive approach assisted by *schoology* was better than the group taught by *scientific PBL;* (3) the average skills of the experimental group was better than the control group. The findings were in line with Nuraina (2018); Ulfa and Wutsqa (2017), Dewi et al (2017), Sulistyowati,

Widodo, & Sumarni (in Imawan, 2015) telling that *guided discovery learning* was effective to improve problem solving skill of students.

Qualitatively, the research described mathematics problem solving skill based AQ. The subjects consisted of 35 students – VIII F of JHS 13 Semarang. They were categorized into *climber, camper,* and *quitter.* The questionnaire results showed that from 35 students, there were 19 categorized *climber,* 14 *camper,* and 2 *quitter.*

The subjects were describsed based on their problem solving skill seen from AQ as follows:

Table 5. Summary of Problem Solving Skill Seen from AQ

No	AQ	KPM	
	Categories	Numbers of the Students	Categories
1	*Climber*	13	High
		4	Moderate
		2	Poor
2	*Camper*	12	High
		2	Moderate
		0	Poor
3	*Quitter*	0	High
		1	Moderate
		1	Poor

Based on the table, from 19 *climber* students, 13 of them had high problem solving skill, 4 with moderate level, and 2 with poor level. The 14 *camper* students consisted of 12 students with high problem solving skill and only 2 students with moderate level. The *quitter* category consisted 2 students. There was not found any high level problem solving skill students but only a student with moderate level and a student with poor level. Here are the descriptions.

Problem Solving Skill of *Quitter* Category Students

Based on AQ categorization, it showed there were 2 *quitter* students. Their skills were varied. It was shown by a student with moderate skill and a student with poor skill. The moderate skilled *quitter* student could master three polya stages: to understand the question, to plan, and to implement the solution. During understanding the question, the quitter student could only write the known and asked elements but his understanding was still poor. The subject could mention the known and asked information but it was not maximum. It could be seen from the interview excerpt. The students acknowledged that he was having difficulty to answer the question and could not answer when there was an elicitation question from the researcher. On planning problem solving solution step, the subject only wrote the planning but he could not write systematically and clearly. This student category only wrote the problem solving planning stage but it was not systhematic and clear. On implementation stage, the student briefly wrote the solution and ignored its mathematics algorithm. On checking stage, the student had not been able to recheck independently and maximally, even it was not done.

Then, another quitter student with poor problem solving could only master 1 polya stage: to understand the question. To understand the question, the *quitter* type student with moderate skill could write the known and asked information although it was still poor. He could not write the information clearly and several stages were not appropriate with the previous calculation although the final answer was correct. In re-checking stage, the student had not been able to recheck maximally.

Based on the explanation, identification of the *quitter* subjects showed that they could only understand. It was in line with several studies. Darojat (2016) stated that *quitter* students could solve problems until understanding stage. Prameswari (2016) found that such students in understanding problem they did no write the information completely and did not explain again by using their words. They also had difficulties to plan the solution and write the solution. Therefore, such students did not re-check again.

Problem Solving Skill of *Camper* Category Students

The AQ categorization showed that 14 *camper* students had various problem solving skill. It was shown by 12 of them having high problem solving skill and 2 of them having moderate level. From the 12 students, they could master all polya stages, such as understanding, planning, and implementing the

solution. In this category, the students could write what was known and asked completely. They also could share their re-checkings with their own language. During planning process, the students could write supportive data to solve the problems by writing the formula until planning the final stage. Then, in planning process, the students were able to write well and based on mathematics regulation. He also could draw each calculation correctly. However, the students, on the re-checking stage, assumed such process was not important. Thus, they only took a look at glance. They were some of them rechecked but they did not believe in their answers and feeling afraid. However, the students could write the conclusion they had.

Then, from two *camper* students with moderate level, they could master 3 polya stages: understanding the questions, planning and implementing problem solving. In understanding stage, the students could the known and the asked information clearly. In this stage, the student could write their strategy but it was not clear and complete. Then, in implementing process, the students could write wel and it was in line with their plans. However, there were several mistakes in finishing the process. The *camper* students with high and moderate skill categories still had no confidence in doing rechecking. Thus, they had not been able to independently recheck.

Based on the explanation above, the identification of *camper* students showed that they could understand the question, plan the solution, and implement the plan into problem solving. However, there were still not confident upon their work during independent check. It was in line with several studies. According to Hidayat and Sariningsih (2018), *camper* students in solving problems required three Polya stages: understanding, planning, and implementing the solution.

Mathematics Problem Solving Skill of *Climber* Students

The categorization of AQ result showed that there were 19 students in this category. Their skills were varied and shown by 13 of them with high problem solving skill, 4 with moderate level, and 2 with poor level. From 13 students with high level, they only could master 4 Polya stages: understanding the question, planning the solution, implementing the solution, and doing recheck.

In understanding the question, the students could write the known and asked information clearly and systemathically for each point. Furthermore, they could answer the question responsively about the information of the question. They also could recheck their problems by their own language.

In planning stage, the students could write supportive data such as the formula until the final plan. Orally, they could explain their strategy in solving the problems correctly. Their implementation of the plan was done well. They had no difficulties and could solve based on their plan. The students could also write the unit of each calculation correctly. In re-checking stage, they could do it by checking each one of their answers, the numbers, the formula, the solution, and the calculation.

Then, 4 climber students with moderate level could master all problem solving stage but they were not careful although they had done it based on the plan. There were 2 *climber* students with other category could do all Polya stages well. However, they were incompletely arranged the solution plan and still had mistakes in their solution.

Based on the explanation, identification of *climbers* showed that they could understand well, plan, and implement their plan correctly. They also could recheck independently. It was in line with several studies. According to Hidayat and Sariningsih (2018), *climbers* in solving problem could understand the problem, plan the solution, and solve the problems through various strategies and could recheck their answers, the process, and the conclusion. Prameswari (2016) stated that *climbers* could solve problems systematically and clearly. They also could recheck again.

Based on the problem solving skills of *quiiters, campers,* and *climbers,* it was known that their problem solving skill based on AQ category were different. In understanding stage, *quitter, camper,* and *climber* were able to do it. In planning the solution, it could be done by *quitter* and *camper.* In implementing the plan, it could be done by *quitter* and *camper.* Then, in re-

checking stage independently, it could be done only by *climber.*

CONCLUSION

Based on the analysis and discussion, it could be concluded that the description of the students' problem solving skills based on *Adversity Quotient* showed various results. It meant that *Adversity Quotient* did not determine problem solving skill so that *guided discovery learning* with metacognitive approach assisted by *Schoology* was needed to achieve problem solving skill.

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