The thinking process of quitter students in solving open-ended mathematical problems

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Abstract. Most Indonesian classes consist of many students coming from various background of ethnicity, cultures and fighting power. The fighting power possessed by a student is classified into three levels, namely high (climber), moderate (camper) and low (quitter). The facts in the field show that there are still many quitter students who need teachers to accommodate their needs in solving mathematical problems. One way to help quitter students solve problems is by giving open-ended questions. This research aims to describe the thinking process of quitter students in solving problems through open-ended questions. This research was a descriptive study with a qualitative approach. The research subjects were two seventh-grade students of Banda Aceh SMPN 19, both of them represented quitter students. Data collection was done by giving open-ended math questions and interviews. The results showed that in solving open-ended mathematical problems, quitter students conducted assimilation and accommodation in understanding problems, implemented problem-solving plans and checking problems, and the quitter students thought assimilatively in planning problem solving. This research can be used in considering the selection of methods and strategies appropriate for quitter students in the mathematics learning process.

1. Introduction
Mathematics plays an important role in education. Learning mathematics is one of the means of scientific and logical thinking and has an important role in efforts to improve the quality of human resources. Mathematics is important because it is one of the basic sciences in various disciplines that develop human mindset [1].

Mathematics learning will be maximal if the teaching and learning process facilitated by the teacher can develop students' thinking and creativity. The teacher must be able to plan learning activities that not only encourage the students to be active but also must be able to make students think because by thinking students are able to understand knowledge [2]. In addition, teachers need to pay attention and accommodate the needs of students. A teacher must have the ability to use supporting facilities in learning that can bring up creative ideas from students [3]. Given the importance of mathematics to improve students' thinking skills, learning mathematics at various levels of education needs to be given serious attention by teachers and must be able to apply effective and efficient methods so that learning objectives can be optimally implemented.
Mathematical materials in Indonesian education curriculum is very dense. Besides that, most Indonesian classes also consist of many students which means that there is a variety of learning styles. The uniqueness of students varies and is no longer homogeneous. This may be caused by a various background of ethnicities, tribes, traditions and cultures [4]. The uniqueness of students consists of many aspects, including the power to fight. A student’s fighting power is very influential in their learning process, especially their willingness and ability to accept, understand and solve problems. Students' fighting power in solving mathematical problems are varied: high, moderate, and low [5]. This can be seen in a student's personal attitude through the process of solving mathematical problems at school.

Completion of mathematical problems requires intelligence in overcoming difficulties (fighting power). An assessment that measures how a person's fighting power in the face of adversity is known as Adversity Quotient (AQ). AQ is an assessment of a person's ability to face difficulties, obstacles and to solve problems they face [6]. AQ is a person's ability to move life's goals forward; it is a measurement of how an individual's attitude responds to difficulties [7].

Stoltz [6] says that AQ has an important influence on people achievement. The success or failure of students in learning mathematics can be demonstrated through AQ. This can be seen from students' responses to mathematical problems. Some students feel challenged by the problems they face, some try to face the challenges and some students give up without trying to solve them. The attitude of students in solving mathematical problems is different, there are those who give up, there are those who try and there are those who never give up until they find a solution to the mathematical problem they face [8].

Stoltz [6] groups students into three categories based on AQ. This grouping is seen through aspects of student attitudes in dealing with each problem and challenge. The student groups are climber (high AQ), camper (medium AQ), and quitter (low AQ).

Students who are in the climber group have high fighting ability and motivation in learning. A climber is a thinker who always thinks of possibilities, never allow other obstacles to hinder their journey [6]. Climber students will try maximally in solving mathematical problems so as to create confidence and motivation in learning. Climber students are able to survive in the face of difficulties and take advantage of their potential [8]. Besides that, they are also easy to recover from a failure to learn and continue to advance to face the next challenge [8]. Climber students never allow obstacles to prevent them from achieving success in solving problems, especially math problems. This attitude helps them improve their mathematics learning outcomes.

Students who belong to the camper group have fighting spirit and motivation in learning. Camper is someone who is camping, at least has seen and responded to a struggle but does not try to reach the peak of success [6]. Camper students are students who have not reached the peak of solving mathematical problems but are satisfied with the results they have achieved. Camper students have a capacity that is not too high for change because they are driven by fear [9]. They tend to seek security and comfort in facing difficulties, and always weigh risks so that they never achieve what they can with their potential, especially in achieving learning achievements [9].

Students in the quitter group struggles and lack motivations in learning. Quitter is someone who chooses to avoid, ignore, retreat, stop and even leave a struggle offered by life [6]. Quitter students prefer to avoid obligations, retreat and reject opportunities. Quitter students are also used to ignoring, covering up, and not eager to get what they want. Quitter students often experience difficulties and are easy to give up in solving problems [5].

The results of preliminary observations conducted by the researchers at a school in Banda Aceh showed that there were more camper students than climber and quitter students. This is in line with previous studies which found that there is only a small proportion of climber and quitter students in a classroom, most of the students belong to the camper category[10-12].
The reality that there are more camper students in a classroom causes the teacher to focus on the camper students. Such condition results in climber and quitter students being ignored. It may not be a problem for the climber students to be neglected, but for the quitter students to be neglected can make them less accommodated in their learning. Quitter students are in dire need of their teacher’s help because they tend to give up quickly, are despair, passive, and not passionate about reaching the peak of solving a problem.

Students generally face difficulties in solving mathematical problems. It can not be denied that quitter students seem to be afraid and even hate math lessons; this can be interpreted that they do not like challenges and difficulties. Polya [13] offers a problem-solving strategy that consists of four steps, namely understanding the problem, arranging a problem-solving plan, implementing a problem-solving plan, and checking the resolution of the problem again.

Mathematical problem solving is inseparable from the thinking process. In learning mathematics and solving math problems, students do the thinking process to arrive at the right answers [10]. Most teachers sometimes ignore the thinking process [10]. The teacher only assesses the final results without investigating how students get the right or wrong answers, which is crucial to identify students’ difficulties, especially the quitter students who have low AQ. The teacher’s efforts to help quitter students are needed to provide stimulus to help them improve and become campers or even climbers. This can be done through special assignments.

Lesson plans designed by the teacher, especially for mathematics learning, should be able to improve students’ AQ. Increasing the AQ of the students, especially quitter students, can deliver success in learning mathematics. Mathematical problem solving requires students to have high AQ so that they get the right solution. Therefore, the teacher should use methods, approaches, or learning models that are suitable for quitter students. The learning method should be able to increase the spirit of quitter students to continue to fight. The aim is to familiarize the students with analyzing a problem even though the resolution and form of the problem are not in the form of algorithms or mathematical symbols that make quitter students avoid solving problems or mathematical problems.

The right way to overcome quitter students’ difficulties in solving mathematical problems is to present problems that are related to their daily lives. The problems should be open-ended because in solving open-ended problems, students can express their ideas freely without interference from the teacher so that the active role of students can be seen [3].

Giving open-ended problems can be done through the application of an open-ended approach. An open-ended approach is a learning approach that starts with introducing or exposing students to open problems [14]. Through this activity, students are also expected to be able to answer problems in many ways, thus inviting intellectual potential and experience of students in the process of finding something new. Open-ended learning can provide opportunities for students to gain knowledge or experience in finding something, recognizing, and solving problems with several techniques [14]. An open-ended approach helps students construct their knowledge fundamentally and is relevant to the experiences of students' daily lives.

The purpose of giving an open-ended problem is that students are expected to develop creative ideas and mathematical thinking patterns [15]. The main purpose of giving open-ended problems to students is not to get answers but rather emphasize how to arrive at an answer [16]. There are many ways to get an answer, so by giving mathematical questions that are open in nature can accommodate students' problem solving [3].

This article is a continuation from previous research that we conducted to describe quitter students’ thinking process. In this article, we provided open-ended questions as the teacher’s solution to accommodate the need of the quitter students. The research question that we addressed in this article is: how is the thinking process of quitter students in solving open-ended mathematical problems.
2. Method
This descriptive research aims to describe quitter students’ thinking process in solving open-ended mathematical problems. In addition, it also wants to describe the AQ of quitter students in solving open-ended mathematical problems. The approach used in this study is qualitative. The research subjects were two students from class VIII of SMP Negeri 19 Banda Aceh in the academic year 2018/2019. The subjects were chosen based on the results of preliminary observations in class VIII at SMP Negeri 19 and tests using the questionnaire Adversity Response Profile (ARP). The results show that there were four students belong to the quitter category. The researcher chose two of the students who had good communication skills according to their teacher. The instruments used in the study are open-ended problem-solving questions and semi-structured interviews. Data were analyzed according to Miles and Huberman’s [17] data analysis namely, data reduction, data presentation, and conclusion.

3. Results and Discussion
During solving mathematical problems, quitter students conducted these activities: reading the open-ended questions, identifying what is known and asked by the questions correctly and smoothly. This shows that the students can assimilate information when they are asked to. This also means that quitter students can integrate newly acquired information directly into the scheme in their minds. Quitter students do the assimilation process of thinking in understanding mathematical problems. This can be displayed in Table 1.

Table 1. Quitter students’ answers in solving problems open-ended.

| Problem Solving Problem on Open-ended | Student Quitter Answer |
|--------------------------------------|------------------------|
| Pak Haji Uma has a rectangular-shaped plank which has a length of 2 meters and a width of 1.5 meters. The plank will be made into a lid with a circular surface. What is the area of the unused part of the plank? | ![Image](image.png) |

Quitter students seemed a little confused in understanding the problem. They were hesitant in determining the radius of the circle of the given problem. Quitter students were used to the circle questions whose radius were known before calculating the area of the circle, but in the open-ended question it was seen that the students themselves should determine the radius of the circle.

After determining the radius of the circle itself, quitter students changed the scheme that has been formed in the thinking process. In solving the problems, there were times when the students themselves determine the size of the radius of the circle. Based on the indicator of the thinking process, it means that quitter students also carry out the process of thinking accommodation in understanding the problem. This is in accordance with Santrock’s [18] statement that accommodation occurs when children adjust their scheme to fit their new information and experience. Therefore, it can
be concluded that quitter students carry out assimilation and accommodation thinking processes in understanding mathematical problems.

In preparing plans for solving mathematical problems, quitter students can describe the plan that they use to solve the problems. The quitter students, in this case, are able to determine the area of the plank that is not used to make the circle. The students try and think further to find other ways of solving the problems.

The quitter students are able to directly integrate each newly acquired information into a scheme in their mind. They satisfactorily mentioned the chosen plan, used selected information to solve the problem, and they were confident in deciding the plan that would be used to resolve the problem. So, it can be concluded that quitter students do the assimilation process of thinking in preparing a problem-solving plan. This is as stated by Ormrod [19] that assimilation is a process of responding to an object or event in accordance with a scheme that has been owned.

In the step of carrying out the mathematical problem-solving plan, the quitter students are generally fluent in carrying out several steps of the plan. There was a small amount of confusion experienced by the students. This can be seen from their step in determining the radius of the circle, they seemed a little hesitant in determining the radius of the circle.

Furthermore, the quitter students run the chosen strategy smoothly, perform calculations repeatedly, and use the correct completion steps. This shows that the quitter students perform the accommodation thinking process when solving problems. This is in line with Suparno’s [20] remark that accommodation occurs if a person cannot assimilate new experiences obtained with an existing scheme, because the new experience is not in accordance with their existing scheme.

The algorithm of calculations performed by the quitter students in general is correct. The students also have a scheme about the problem-solving plan and can decide what plans will be implemented first. In solving the problem, they use the concept of a broad rectangle, square and circle. So, it can be said that quitter students also do the assimilation process of thinking in implementing mathematical problem-solving plans. Assimilation is the process of changing what is perceived so that it fits the cognitive structures. Thus, it can be concluded that in implementing a mathematical problem-solving plan, quitter students do the thinking process of accommodation and assimilation.

After resolving the problem, the quitter students actually no longer want to check the answers. But after being asked to check, they check the answers by examining each step that has been completed. After re-examining their answer, the students are certain that their final answers are correct. So, it can be said that the students are able to integrate directly any newly acquired information into the scheme that is in their mind.

Based on the re-checking activity, it can be concluded that quitter students carry out the assimilation process as well as accommodation in re-examining mathematical problems. This is similar to Melnick's statement [21] that assimilation is the incorporation of features from the environment into existing structures. The overall thinking process of quitter students can be seen in Table 2.

Table 2. Conclusions on the Process of Thinking Quitter Students in Solving Mathematical Problems

| Step of problem-solving                  | process of thinking |
|------------------------------------------|---------------------|
| Understanding the Problem                | Assimilation        |
| Prepare a Problem Solving Plan           | Assimilation        |
| Implementing a Problem Solving Plan      | Assimilation        |
| Checking Again Against Problem Solving   | Assimilation        |
4. Conclusion
The thinking process of quitter students during solving open-ended questions involve assimilation and accommodation in understanding problems, implementing problem-solving plans and checking problems. The quitter students think assimilative in preparing problem-solving plans.

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