The optimism of junior high school students in mathematical problem posing

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Abstract: One role of optimism is to examine how students solve problems in learning mathematics. However, there is still limited research that reveals students' optimism in posing mathematical problems. This study aims to describe the dimensions of students' optimism in the mathematical problem posing. This research employed a qualitative method. The research subjects consisted of four Year 8 students (two low-achieving and two middle-achieving students in posing a problem) of one Islamic junior high school in Pidie Jaya, Aceh, Indonesia. The subjects were selected purposively based on their ability to raise problems related to the rectangular pyramid topic. To examine the dimensions of students' optimism, the researchers interviewed the subjects by referring to optimism indicators proposed by Seligman: permanent bad-events, pervasive bad-events, personal bad-events, permanent good-events, pervasive-good events, and personal good-events. The results showed that: (1) although students have the same problem-posing abilities, they were in a different dimension of optimism, (2) students who had moderate problem-posing abilities were more optimistic than students with low problem-posing abilities, (3) students who had low or moderate problem posing skill tend to be in the pervasive bad event-dimension. In summary, optimism affects the students' ability to pose mathematical problems.

1. Introduction

Optimism, as a psychological factor in humans, greatly affects one's learning process. This factor is a strong hope for all substantial aspects in a person's life so that the person can cope with the problem well, despite the problems faced and frustration [1]. Added by [2] that optimism is a type of resilience, which is characterized in various ways, including as a mechanism and process that guides some individuals to develop even in poor living conditions. An optimistic person will see failure as a process of self-development that will have future good consequences and view good experiences as something worth getting. Therefore, the study of the role of optimism in learning becomes very important to be explored further, for example, in learning mathematics.

In general, learning mathematics in school is inseparable from problem-solving. The goal is that students can solve problems correctly in accordance with the mathematical method. The activities can consist of understanding problems, designing mathematical models, completing models and interpreting the solutions [3]. The previous research in mathematics learning related to problem-solving found that students who have high levels of optimism have higher mathematics achievements compared to students who are pessimistic [4]. Furthermore, [2] stated that optimism could improve
students’ problem-solving abilities and creative thinking. However, the two studies have not examined in detail the optimism of students in proposing problems as an approach to solve problems in learning mathematics.

Problem-posing is closely related to problem-solving and contributes to the development of mathematical thinking, by providing opportunities for students and teachers to discuss and take initial steps towards the study of mathematics [5]. Learning involving a problem posing approach will bring out a better understanding of the topics and the learning process [6]. In addition, problem posing is an attempt to create new problems or refine existing problems [7]. Problem posing affects both students and teachers who teach mathematics [8].

According to [9], there are three forms of activities in problem posing, namely 1) Pre-solution Posing, which is creating questions based on the situation presented; 2) Within-solution Posing, which is reformulating the problem being solved; and 3) Post-solution Posing, which is modifying the condition of a problem that has been solved to produce a new problem. These three activities are very useful for developing students’ mathematical skills and investigating their understanding of mathematics [10]. Problem-posing is also related to a teacher’s ability to motivate students through the formulation of challenging situations. Thus, students can ask questions to resolve and have an impact on their ability to solve problems. One of the common issues in the learning process is that the only tasks given to students are those proposed by the teacher or the ones available in the textbook [11]. Therefore, teachers need to consider the application of problem-posing in mathematics learning and assess students’ optimism during the problem-posing application.

The teacher rarely involves students to pose problems in mathematics learning. Problems in learning mathematics are dominantly provided by the teacher, not by students. This is possible because learning has so far placed the teacher as the dominant source, while students are less active in interacting both with the teacher and their peers. As a result, students are not brave enough or lacking in optimism in asking questions, let alone being asked to pose problems. Thus, students’ problem-posing ability and optimism is the concern of the teacher. Teachers should encourage students to be successful in learning. That is because the ability to raise problems and optimism is necessary for facing all challenges faced. People who can raise problems will be able to provide new insights from those problems. Based on these rationales, researchers were interested in researching on student optimism in posing problems. This study aimed to describe the dimensions of student optimism in raising mathematical problems.

2. Method
This research was a qualitative research. The participants were four Year 8 students of one Islamic junior high school in Pidie Jaya. Two students had the low problem-posing ability and two students with medium problem-posing ability. The participants were selected purposively based on their ability to pose problems related to the rectangular pyramid topic through mathematics tests. Tests were administered to investigate the level of students' ability to submit mathematical problems consisting of three questions. Submission of problems was analyzed based on the quality and complexity of the problems [12]. Furthermore, to determine the dimensions of student optimism, the researchers interviewed the subject by referring to optimism indicators by [13], namely permanent bad-events, pervasive bad-events, personal bad-events, permanent good-events, pervasive good-events, and personal good-events. The key questions in the interview guidelines were based on the optimistic and non-optimistic indicators. The indicators of the dimensions of optimism can be seen in Table 1.
### Table 1. Indicators of student optimism.

| Dimension of Optimism          | Optimistic                                                                 | Not optimistic                                                                 |
|-------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| PMB (Permanent Bad-Events)    | Bad events are considered temporary                                          | Failures, rejections and challenges that are felt in terms of "always" and never |
| PVB (Pervasive Bad-Events)    | Trying to correct the situation (unsuccessful when failure occurs)          | Failure to give up on everything, even though it only failed in one thing       |
| PSB (Personal Bad-Events)     | Respond to events that are not good because there are shortcomings in him    | Blame yourself, feel guilty                                                    |
| PMG (Permanent Good-Events)   | Projecting the cause Overall, showing Continuous success (Assuming good events will always happen) | Interpret bad events that occur with the words "sometimes" and "today"         |
| PVG (Pervasive Good-Events)   | Good events are accepted as a result of global / overall reasons (success in all aspects) | Good events are accepted as a result of specific / specific reasons           |
| PSG (Personal Bad-Events)     | Reality Looking at events that are both because of the contribution they make (internal reasons) | Making excuses due to external factors                                          |

* Source: [13]

### 3. Results and discussion

The results of the assessment based on the rubric of the ability to submit problems showed that the ability of four students in this study were in the low and medium category. Two students with medium ability in presenting a problem (A1 and A2) scored seven and eight. Meanwhile, two other students with low ability in raising a problem (B1 and B2) obtained the scores of three and four. Figure 1 shows an example of the problem submission by low-ability students (B1) on pre-solution posing activities. The problem submitted, such as in Figure 1, is based the teacher's demand on creating a problem based on the given situation, namely showing a picture of a pyramid with the known the length of the sides. However, students do not use the context in the problem. Instead, students change the things that are known in the problem to create their own problems. According to [11], the submission of such problems is categorized as at Level 1.

If a pyramid has the length of CD = 8cm, TO = 14cm and the surface area 280cm$^2$, calculate the volume of the pyramid!

![Figure 1. The results of student (B1) problem posing based on aspects of pre-solution posing](image-url)
To investigate the extent of B1’s optimism in posing the problems, researchers conducted interviews as shown in Figure 1. The following is interview excerpt:

P : What makes you ask questions differently from the context given?
B1 : Because I misunderstood the instructions for the questions, I think I should make new questions that are not based on the context given
P : If the same problem is given, can you solve it correctly now? (PMB)
B1 : Not necessarily.
P : If your answer is wrong again, what are you going to do? (PVB)
B1 : I will study again, so that in the future I will not repeat the same mistakes.

Based on the results of the interviews that were reviewed based on the indicators in Table 1, it was found that the first question was included in the dimension of optimism PSB (Personal Bad-Event). Thus, B1’s optimism included in that dimension. The second answer belongs to the optimism dimension of PMB (Permanent Bad-Events) and B1 was classified as not being optimistic. The third answer belongs to the PVB (Pervasive Bad-Events) dimension and B1 was optimistic. Therefore, B1 has varying optimism.

Figure 2 shows an example of the problem submitted by a student (A1) is in the Within Solution Posing activity. In this aspect, a problem was given and based on the problem the student were asked to create a new problem. Here, it is seen that students have led to make within Solution Posing questions. According to [11], the submission of such problems at Level 3.

![Figure 2](image)

| Berapakah luas sebuah limas segi empat, jika luas alasnya adalah 96 cm² dan tingginya 4 cm? |
| What is the area of a rectangular pyramid, if the area of the base is 96 cm² and the height is 4 cm? |

Figure 2. Results of student problem posing (A1) based on Within Solution Posing aspects.

To investigate the extent of A1’s optimism in raising a problem, the researchers conducted interviews as follows.

P : What makes you able to pose questions based on the context given?
A1 : I answered correctly because I had learned about it before.
P : If the instructions for the problem are different can you solve it?
A1 : Of course, because the next question still uses the same problem.
P : What if it is about a different topic, can you apply it too?
A1 : Yes, I can apply it in any material.

The results of the interviews were reviewed based on the indicators of Table 1. The first answer belongs to the optimism dimension of PSG (Personal God Event) and A1 students were optimistic. The second answer belongs to the optimism dimension of PMG (Permanent God Events) and B1 was not optimistic. The third answer belongs to the PVG (Pervasive God Events) dimension and B1 was optimistic.

The results of interviews of all four students showed that two students (A1 and A2) who had medium ability to pose questions were optimistic in the PMB dimension. One student who has a low ability to pose (B2) was optimistic, and one student (B1) was not optimistic in the PMB dimension. Seligman [13] said that optimistic children consider bad events only temporary while the pessimistic show the bad events occurred as failures, perceiving rejection in terms of "always" and never ".

In the fourth dimension of PVB, students who have low or moderate ability to pose problems (A1, A2, B3 and B4) are equally optimistic. Based on an interview excerpt, some statements can be quoted
"I will try to correct the mistake and study it again so that I find the right answer". This is in line with Nolismasari [14] reporting that some students do not give up when they have not successfully created problems but some students create partially correct problems and think it is correct; then they are categorized as optimistic in the PVB dimension.

Students with moderate problem solving abilities (A1 and A2) were optimistic in the PSB dimension. One student who had a low ability to pose problems (B1) was optimistic on the PSB dimension while one student (B2) was not. This unfortunate event occurred when students were unable to solve problems, Seligman [13] stated that the child is said to be optimistic in the PSB dimension if a bad event is considered to occur because of his weakness; children who like to blame themselves when bad events happen to them are not optimistic in the PSB dimension.

In the PMG dimension, it is seen that one student whose ability to submit a mathematical problem is moderate (A1) was optimistic, while one student (A2) was not. Two people who have a low ability to pose mathematics problem (B1 and B2) are not optimistic in the PMG dimension. Some statement can be quoted from the interview excerpt such as "I really solved the problem well, the answer would be correct" in the PMG dimension, showing an optimistic student in raising a problem. Seligman [13] argued that an optimistic child thinks that a good event will always happen because I have tried my best in life. Whereas students were not optimistic in the PMG dimension said "it could be, because if my problem is correct then any problem must be true". This is in line with Nolismasari [14] who argued that if students respond to good events and can solve problems sometimes, they are said to be not optimistic in the PMG dimension; if they interpret good events occurred as "sometimes" and "today".

In the PVG dimension, there were two students with moderate ability to pose problems (A1 and A2) who were optimistic. Besides, two people who had a low ability to pose problems (B1 and B2) were not optimistic in the PVG dimension. Students who were optimistic about the PVG dimension felt comfortable in math and liked it. According to Nolismasari [14], good events occur because of the nature and abilities of the students or because the subject is capable of learning. Students were not optimistic in the PVG dimension because good events were accepted as specific reasons, that was, being able to do mathematics only on certain topics. Seligman [13] said that the child who reason to be able in mathematics for the good events occurred is a child who is not optimistic because they make specific reasons.

In the PSG dimension, three students were optimistic, namely two people who have moderate ability to pose problems (A1 and A2) and one person who has a low ability (B2). In this PSG dimension, one student with a low ability to pose problems (B1) was not optimistic. In the PSG dimension, an optimistic indicator was seen in the interview excerpt, "I have answered the question correctly and have previously learned about the problem". According to Seligman [13] a child who realistically look at good events occurred is an optimistic child. Students were not optimistic in the PSG dimension, because they mentioned external factors, namely easy problems. This can be seen in the subject's statement "Creating question for number three is very easy because it is easy to understand", showing that the subject was not confident in his abilities as he thought he could solve the problem because the problem is easy. They were optimistic in the PSG dimension, because they had tried hard to solve the problem. In contrast with the pessimistic students, Yates [4] revealed that students who are not optimistic in life have lower mathematics achievement.

4. Conclusions
This research had found the dimensions of students’ optimism related to the ability to pose problem in mathematics learning. Even though students had the same problem-solving abilities, these students were on a different dimension of optimism. In addition, students who have moderate ability to pose problem were more optimistic than those with low abilities. In addition, students who had low or moderate ability to pose problem were in the pervasive bad event dimension. Therefore, teachers need to consider differences in students' optimism in learning mathematics. In this study, researchers did not gave any treatment using problem-posing approach, instead only administered a test to examine the
students’ ability to pose problems based on their level. For more optimal results in assessing students' optimism about problem-posing, the next researcher should first treat the subjects using problem-posing approach.

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