ANALYSIS OF TEACHER’S AND STUDENT’S NEEDS OF MATHEMATICAL PROBLEMS IN DISASTER CONTEXT

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| **Article Info** |  | **ABSTRACT** |
| ***Article history:***  Have been presented at SEADR July 26, 2019 |  | Indonesia is an archipelagic country lies on the Pacific Ring of Fire. Those geographical location causes Indonesia to become a disaster prone country used as one of the context in learning mathematics. The mathematical presentation problems in disaster context can improve mathematical literacy, ability to solve mathematical problems, and reduce the risk of disaster. Teachers need to make the students get used to manage natural disaster situation in more logical approach. Therefore, it is necessary to develop mathematical problems in disaster context. This research is an early stage of development. The purpose of this study was to analyze the needs of teachers and students of mathematical problems in disaster context. The participants in this study were a math teacher and 53 students of year 7 and year 8 at SMP Negeri 1 Banda Aceh which located in affected area of Tsunami. The data was collected through an open questionnaire with 12 questions for both teacher and student. Data analysis was carried out descriptive. The results of this study on the importance of mathematical problems in disaster context include: (1) A teacher often provide math problems in learning and 41,5% of students like to solve mathematical problems; (2) the teacher has never read mathematical problems in disaster context and only three students who have ever read about it; and (3) the teacher and 71,7% of students agree and willing to participate in learning proccess of mathematical problems in disaster context. The results of this study showed the lack of capabitily of mathematical problems in disaster context so it needs to develop. |
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1. **INTRODUCTION**

Indonesia’s geographical place has caused Indonesia to become a disaster-prone country that requires the resilience in every element of society toward disaster risk. Disasters are events that occur due to natural or non-natural factors that have an impact on loss of life and damage to infrastructure (Mcdonald, 2003). Disaster events can be triggered by natural events, human actions or a combination of both (Amri, 2017).

An important part of disaster management is the mitigation that is a series of efforts to reduce disaster risk, both through physical development, awareness and improvement of the ability to confront disaster threats (UURI, 2007). Disaster mitigation efforts are efforts to save themselves from natural disasters that occur suddenly that can threaten someone's life (Setiawan, 2016). Communities threatened by disasters are so diverse that the most strategic way to educate disaster mitigation is through formal and informal education.

One of the efforts that the school can do as a formal educational institution in reducing disaster risk is through the integration of disaster risk education in extracurricular activities and various subjects (Amri, 2017). one of which through regular lesson such as mathematics (Shadiq, 2016) because mathematics is a clear and logical means of thinking to solve contextual problems (APEC, 2012).

Aceh is the seventh province out of 34 provinces with a total of 2,000 schools in a high-risk disaster area (Kemendikbud, 2018) so that disaster used as one of the context in learning mathematics. The context provided in learning can be gained from nature, social life, culture, economy, and religion. Therefore, the content of learning materials is inseparable from the student’s learning environment and the daylife environment (Zakiyah, Yuliyanti, & Rusdiana, 2014) Context plays an important role in achieving the goals of learning mathematics because context can help students reach the meaning to the material (Johnson, 2002). It also plays an important role in helping students to solve mathematical problems, making it easier for students to choose the path used to solve problems and provide strategic solutions to students in solving problems (van den Heuvel-Panhuizen, 2005). Provision of context in the learning environment can provide answers to students' problems "why should I study this?" and can bring meaningful learning.

The results of the survey conducted by the Programme for International Student Assessment (PISA) showed that the achieved Indonesian students in 2015 is still below the average expectation, despite get a better result compared to previous PISA test. Furthermore, from the six levels of PISA, more than 50% of Indonesian students do not reach the lowest level. Responding to this problem, one of the efforts that the teacher can do is to present contextual problems to familiarize students with their problem solving ability and mathematical literacy. The way of mathematical teachers presented the problems in disaster context can improve mathematical literacy, ability to solve mathematical problems, and reduce risk of disaster. Previous researcher such as Fatmawati and Ekawati (2016) have developed the mathematical problems equivalent to PISA’s Change and Relationship content, with the mathematical problems in disaster context. But the availability of mathematical problems in disaster context is still lacking so it needs to be developed. Therefore, researcher do an early stage of development with the formulation of problems is “what are teacher’s and student’s needs of mathematical problems in disaster context?"

1. **METHOD**

This study is an early stage of development at the preliminary stage of the Tessmer model (Tessmer, 1993). The purpose of this study is to analyze the needs of teachers and students of mathematical problems in disaster context. The participants in this study were a math teacher and 53 students of year 7 and year 8 at SMP Negeri 1 Banda Aceh which located in affected area of Tsunami. The data was collected through an open questionnaire with 12 questions for both teacher and student. Question number 01 to number 07 is used to know the characteristics of the participants of this study while the number 08 to number 12 is used to know the importance of mathematical problems in disaster context. Researcher continue the interview with several participants to analyse the results of the poll answers in a deeper. Data analysis is done in a descriptive.

Example of mathematical problems in disaster context provided in the questionnaire were adapted from research Khalid (2016) as follows:

Abu is standing on a beach when he heard the tsunami warning siren. He immediately decided to run to a safe place. He had 3 choices; go to a small hill or a shelter built for tsunami, which can be reached via two ways. The hill is 500 metres and the shelter is 800 metres away from the beach. However, to reach the top of the hill, Abu need to climb 300 steps of staircase. Abu can run at an average rate of 5m/s and he can climb the stairs at the rate of 3 steps/s. He may also use the curved road (specially made for the shelter) which is 900 metres long, where he can run at 6m/s. In your opinion, which way should Abu take? Please explain!

1. **RESULTS AND DISCUSSION**

The answers of question number 01 to number 07 of teacher's questionnaire and student’s questionnaire showed that the participants of this study have followed the Earthquake and Tsunami disasters mitigation that they already have prior knowledge about disasters and disaster mitigation. The participants could well explain the definition of disaster and cited the example of a disaster as well as things to do when a disaster occurs. Places that can serve as a preliminary evacuation by participants include evacuation building, hill or mountain, diesel floating boat, tsunami museum, tall buildings, and mosques. The participants got information about disaster through electronic media, paper products, school and parents.

The questionnaire sheets of math teacher who taught in class VII and VIII showed that the math teacher has often give mathematical problems in learning mathematics but she never read/solve mathematical problems in disaster context. The teacher has agreed that mathematical problems in disaster context is taught in learning mathematics because it can improve student’s mathematical literacy.

The questionnaire results of students of year 7 about the student’s needs of mathematical problems in disaster context as follows:

**Table 1.** The student’s needs of mathematical problems in disaster context of year 7

Regarding to the survey, result of year 7, the diagram show that all students preferences, there are 20 students happy with mathematical problems but only 17 students assert that they are interested in mathematical problems in disaster context. Only three students ever read/solve mathematical problems in disaster context. There were 26 students assert that they agree if the teacher give mathematical problems in disaster context in learning and willing to solve mathematical problems in disaster context based on methods.

The questionnaire results of students of year 8 about the student’s needs of mathematical problems in disaster context as follows:

**Table 2.** The student’s needs of mathematical problems in disaster context of year 8

The data result from year 8 show that only 2 students feel happy with mathematical problems but 12 students assert that they are interested in mathematical problems in disaster context. All of students never read/solve the mathematical problems in disaster context based on methods. There were 12 students assert that they agree if the teacher give mathematical problems in disaster context in learning mathematics and willing to solve mathematical problems in disaster context.

There were 7 students who answered not happy in the mathematical problems but attracted to mathematical problems in disaster context. Providing the contextual problems can increase student motivation in learning mathematics [13] so that participants who were not happy in the mathematical problems can show positive attitudes of mathematical problems in disaster context.

The questionnaire results of students of year 7 and year 8 about the student’s needs of mathematical problems in disaster context as follows:

**Table 3.** The student’s needs of mathematical problems in disaster context

Regarding to the results of year 7 and year 8, the diagram show that all students preferences, there are 22 students (41,5%) happy with mathematical problems but 26 students (49,1%) assert that they are interested in mathematical problems in disaster context. Only three students (5,6%) ever read/solve mathematical problems in disaster context. There were 38 students (71,7%) assert that they agree if the teacher give mathematical problems in disaster context in learning and willing to solve mathematical problems in disaster context based on methods.

The questionnaire results of students of year 7 about the student’s needs of mathematical problems in disaster context as follows:

**Table 4.** The student’s needs of mathematical problems in disaster context of year 7

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Subject** | **Question Number** | | | | |
| **08.**  Do you like to solve mathematical problems? | **09.**  Have you ever read/solved mathematical problems in disaster problems? | **10.**  Do you agree if the teacher gives a mathematical problems in disaster context as the example?? | **11.**  Are you interested of mathematical problems in disaster context as the example? | **12.**  Are you willing to solve mathematical problems in disaster context as the example? |
| A | Not Happy | Never | Disagree | Not Interested | Willing |
| B | Happy | Never | Agree | Not Interested | Willing |
| C | Happy | Never | Agree | Interested | Willing |
| D | Not Happy | Never | Agree | Not Interested | Willing |
| E | Happy | Never | Disagree | Not Interested | Not Willing |
| F | Happy | Never | Agree | Not Interested | Willing |
| G | Not Happy | Never | Agree | Not Interested | Willing |
| H | Not Happy | Never | Agree | Interested | Willing |
| I | Not Happy | Never | Agree | Interested | Willing |
| J | Not Happy | Never | Agree | Interested | Willing |
| K | Happy | Ever | Agree | Interested | Willing |
| L | Happy | Ever | Agree | Not Interested | Willing |
| M | Happy | Ever | Agree | Interested | Willing |
| N | Not Happy | Never | Agree | Interested | Willing |
| O | Happy | Never | Agree | Interested | Willing |
| P | Happy | Never | Agree | Interested | Willing |
| Q | Happy | Never | Agree | Interested | Willing |
| R | Not Happy | Never | Agree | Not Interested | Not Willing |
| S | Happy | Never | Agree | Not Interested | Willing |
| T | Not Happy | Never | Agree | Interested | Not Willing |
| U | Happy | Never | Agree | Interested | Willing |
| V | Happy | Never | Agree | Not Interested | Willing |
| W | Happy | Never | Disagree | Not Interested | Willing |
| X | Happy | Never | Disagree | Not Interested | Not Willing |
| Y | Happy | Never | Agree | Interested | Willing |
| Z | Not Happy | Never | Disagree | Not Interested | Not Willing |
| AA | Not Happy | Never | Agree | Not Interested | Willing |
| AB | Happy | Never | Agree | Interested | Willing |
| AC | Happy | Never | Agree | Interested | Willing |
| AD | Happy | Never | Agree | Interested | Willing |
| AE | Happy | Never | Agree | Interested | Willing |

Here are excerpts of an interview with participant K, one of the three students of year 7 who ever read/solve a mathematical problems in disaster context:

*Q: do you like mathematis?*

*A: yes miss.*

*Q: which one do you prefer, problems on number or word problems?*

*A: word problems miss*

*Q: you answered for question of number 10. What is the problem and where do you read it?*

*A: yes mis, The problem is about how much medicine needs for disaster victim. I read it in the elementary school, "Thematic" book.*

Both questionnaire sheets and the results of participant interviews K showed that the participant liked mathematics and word problems. She had read/completed mathematical problems in disaster context from the book "Thematic" when she was in elementary school. "Thematic" is a book that has a mix of themes to link some subject’s content and develop material based on the environment so that can provide meaningful experience for students (Permendikbud, 2014).

Five students from the six students interviewed, mentioned the same answer about the reason of student’s low interest on mathematical problem in disaster context. Here's an interview with participant B:

*Q: do you like mathematics?*

*A: less miss*

*Q: which one do you prefer, problems on number or word problems?*

*A: both of them miss*

*Q: why did you answer happy at number 08 but answered that you were not interested in number 11?*

*A: because of the length of the problem miss*

Both result of interview and questionnaire from participant B represent 5 people who mentioned the same reason, from which concluded that they like mathematics. She agree and will solve the problem if the teacher give it. But they low interest in mathematical problems in disaster context is due to the lenght of the problem, from which concluded that they try to abstain from more complex case.

From the answers to student questionnaires and transcripts of interviews with several participants concluded that there are some students who are happy with mathematical problems but are not interested in mathematical problems in disaster context because the sample form presented is too long. Therefore, students need to be used to solve contextual problems because students who are not accustomed to completing them will have difficulty on the subject in the future, even leading to refusal to finish them. Contextual problems cannot directly make students easier to understand, not directly motivate students (Boaler, 1993; Carraher & Schliemann, 2002) and does not directly guarantee students learn meaningfully. So, teachers need to involve students together in interpreting contexts to explore ideas in solving mathematical problems (Widjaja, 2013). Students who were not familiar in solving contextual problems would have trouble in learning proccess because they are required to able to connect the knowledge they possessed to the application in life. Mathematic’s contextual problems should be also developed by using a sentence that easily understood by relatively average student.

Based on the results of this study, concluded that it is necessary to continue the research of mathematical problems in disaster context’s development, because improves student’s mathematical literacy, problem solving ability, and reduces disaster’s risk.

1. **CONCLUSION**

Results of this study on the importance of mathematical problem in disaster context include: (1) a teacher has often give mathematical problems in learning mathematics and 41,5% of students feel happy toward mathematical problems; (2) the teacher has never read mathematical problems in disaster context and only three students who have ever read mathematical problems in disaster context; and (3) teacher and 71,7% of students was agree and willing to participate in learning proccess of mathematical problems in disaster context. Based on the results of this study, concluded that is necessary to continue the research of mathematical problems in disaster context’s development, because improves student’s mathematical literacy, problem solving ability, and reduces disaster’s risk.

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