Analysis of the initial capabilities of students to landslide disasters

I H Husna and A Fauzi

Department of Physics, Faculty of Mathematics and Natural Sciences, Universitas Negeri Padang, Jl. Prof Hamka, Padang 25131, Indonesia

*ahmadfauzi@fmipa.unp.ac.id

Abstract. Data from the National Disaster Management Agency (BNPB) in 2018 shows that landslides are the third sequence of disasters highest after pickaxes. West Sumatra, especially the City of Padang is an area that has high potential of landslides. This study aims to describe the initial ability of students to landslide in developing teaching materials of senior high school physics landslide theme. This research uses a descriptive qualitative method with data collection by using a questionnaire. The results of this study indicate that (1) students’ knowledge about landslides is in the medium category with an average value index in 43.87; (2) The average skill of students from all three indicators is in the medium category with a grade index in 69.01. The results of the analysis of prior knowledge of the landslide disaster indicate that it is necessary to develop high school physics teaching materials.

1. Introduction

Indonesia is very potential to natural disasters. Potential natural disasters in Indonesia include floods, earthquakes, landslides, droughts, tsunamis, tornadoes and volcanoes [1]. National Disaster Management Agency (BNPB) said, until November 2016 there have been 1985 disasters in the country. The number is twice that of 2007, as many as 816 disasters. Then the following year, BNPB recorded 1,073 disasters and increased to 1,246 disasters in 2009. The number continues to increase to 1967 disasters in 2014, and 1,677 disasters of 2015. Types of disasters that often occur in Indonesia, namely floods, landslides, and earthquakes, and volcanic eruptions. The disaster occurred in several provinces in Indonesia, especially Central Java Province [2].

West Sumatra Province has a very diverse disaster potential such as floods, landslides, whirlwinds, coastal erosion, earthquakes, tsunamis, fires and others. In the rainy season there is often an avalanche of land on hills or mountains. Some points that are prone to recurrent landslide area in western Sumatra are Lubuk Peraku, Lubuk Selasih, Batang Anai, Bukit Putus Bungus, Pasar Minggu Tarusan, and Bukit Apit. Avalanche that happens always related to the loss of life and property so that this problem becomes very crucial to be handled both in terms of policy (government) related agencies and victims that occurred.

Disaster education is an important education for the life of the community, because disaster is an event that many negatively impact on human life. Although in a certain area is not at all potential for disaster, but disaster education should still be applied, because it does not close the possibility of disaster will come anytime and anywhere. Understanding of disaster is very important given to the surrounding community to improve their ability in order to minimize the impact caused by the disaster.
People with disaster preparedness will be able to face and carry out rescue action during a disaster. Many people do not understand the threats and risks of their respective disasters, because of the lack of geographic knowledge of their own territories. People who do not understand geography knowledge can exacerbate the impact of disasters and endanger them. The potential and the threat of disaster are strongly influenced by the spatial aspects of geography and environment.

Research on the understanding of landslides in Indonesia has been widely practiced. The analysis of the level of preparedness of citizens facing the potential of municipal disaster landslide Semarang. From research conducted can be seen that the knowledge of the people of Semarang city against landslides in general fall into the category almost ready. Of the 19 location points, 2 locations are in the category not yet ready. Therefore, further action is needed to increase public knowledge about landslides. Other research is research conducted on the level of public knowledge of floods, earthquakes and landslides in Wonogiri sub-district. From the research conducted it can be concluded that the community already knows how to prevent and reduce the impact of flood disaster in each kelurahan. While the earthquake and landslide disaster is less known to the public, because both disasters occur in low intensity and the disaster is more difficult to predict. From this it can be seen that public knowledge about landslides is still lacking.

Disaster Management Agency (BPBD) West Sumatera in the Year 2017 set Padang Intelligent Disaster as the motto of disaster management. Declaration of intelligent disaster field gave birth to the vision of BPBD "Padang Kota Cerdas Bencana" which also set the missions that became the basis for achieving the goal. Realizing the Intelligent Padang City is to build a culture of preparedness and increase the knowledge of disaster risk reduction community (DRR) by involving all elements such as government institutions, education, business world and so forth. One of the important elements to be able to increase the knowledge of society is through education. In the world of education can be applied safe school disaster. According to the Head of BNPB Regulation No. 4 of 2014 Safe School Disaster is a learner community committed to a safe and healthy culture, aware of the risks, has a well-established and established plan before, during and after the disaster, and is always ready to respond in times of emergency and disaster. Referring to the disaster safe schools referred to in Perka BNPB number 4 of 2014 BPBD develops in accordance with the vulnerability of Padang City by establishing intelligent disaster schools. However, from the questionnaires distributed to students in one of the public high schools in the city of Padang was the initial ability of students to landslide disaster has not been as expected. It proves that in the education sector has not realized the vision of the Padang city mission is to make the city of intelligent disaster intact. Therefore, to solve these problems need to be developed an instructional material that integrated disaster materials in order to improve students' ability to landslide disaster.

2. Research Method
This descriptive research is qualitative. Data collection method used is a questionnaire method. The questionnaire is used in the form of an open and closed questionnaire, which is a questionnaire that asks respondents to provide information in response to their understanding. The survey was conducted in July 2018 at Padang Public Middle School 6. The population in this study were all students of class XII SMA Negeri 6 Padang consisting of 9 Classes. While the research sample was taken by purposive random sampling technique, obtained by class XII Natural Sciences 2 with the number of students 28 people as the research sample. Qualitative research procedures are in accordance with the following: establish research focus, collect data, process data, analyze data, and present data.

The first research for qualitative research is determining research questions. The research question in this study is to be searched from research. The research method used in data collection is using non-tests. In this case there is no test technique used by the question namely students 'knowledge for the data needed to know the level of students' knowledge. The learner's initial ability is seen from two aspects, namely knowledge and skills. For the aspect of knowledge, an open questionnaire is used which contains 6 basic questions related to landslides, namely landslides and why can they occur? What triggers landslides? What are the initial symptoms / signs of soil movement or landslides?
Mention 4 factors of natural conditions and 5 factors of human activity that cause landslides, and what are the effects of landslides? For aspects of skills that consist of 3 indicators, namely the skills of students before, now, and after landslides. In the aspect of skills, a closed questionnaire is used, which can reduce research time and facilitate qualitative analysis.

Data processing for aspect of knowledge and skills using a measurement scale is the interval scale is changed in ordinal scale in three categories, namely high, medium, and low. The interval scale is changed to an ordinal scale consisting of three categories: high group with a score more than $\bar{x} + 0.5 \text{SD}$, medium group with score $\bar{x} - 0.5 \text{SD} < \bar{x} < \bar{x} + 0.5 \text{SD}$, and group low with score less than $\bar{x} - 0.5 \text{SD}$ ($\bar{x}$ is the mean score of the initial ability and SD is the standard deviation) [6].

3. Results and discussion

3.1 Early ability of learners on the knowledge aspect

The results of the analysis of students' knowledge of the six questions posed, namely What is landslide?, What triggers landslides ?, What are the initial symptoms / signs of soil movement or landslides? natural conditions factors and 5 human activity factors that cause landslides ?, and what are the effects of landslides, which are shown in Table 1.

| Question                                                                 | Mean ($\bar{x}$) | Std. Deviation (SD) | Percentage responden Low ($\bar{x} - 0.5 \text{SD}$) | Medium ($\bar{x} - 0.5 \text{SD} < \bar{x} < \bar{x} + 0.5 \text{SD}$) | High ($\bar{x} - 0.5 \text{SD}$) |
|-------------------------------------------------------------------------|------------------|---------------------|-------------------------------------------------------|------------------------------------------------------------------------|----------------------------------|
| Is that a landslide?                                                     | 47.32            | 14.17               | 21.43                                                 | 67.85                                                                  | 10.71                            |
| What triggers landslides?                                               | 43.75            | 21.10               | 46.42                                                 | 35.71                                                                  | 17.86                            |
| What are the initial symptoms / signs of soil movement or landslides?   | 31.25            | 12.95               | 0                                                     | 78.57                                                                  | 21.43                            |
| How are the characteristics of areas prone to landslides?              | 34.82            | 14.17               | 64.28                                                 | 0                                                                      | 35.71                            |
| Mention the factors causing landslides?                                 | 58.03            | 18.07               | 10.71                                                 | 50.00                                                                  | 39.28                            |
| What is the impact of landslides?                                       | 48.21            | 19.16               | 32.14                                                 | 42.86                                                                  | 25.00                            |

Table 1. is the result of an analysis of students' knowledge of landslides. For the first question, the respondent's knowledge of the meaning of landslides obtained an average score for all respondents, namely 47.32; for question 2 about the trigger of landslides obtained an average score of 43.57; for the 3rd question about the initial symptoms / signs of soil movement or landslides, an average score of 31.25 was obtained; for question 4 about the characteristics of areas prone to landslides, a score of 34.82 was obtained; for question 5 concerning the factors of natural conditions and human activity factors which caused landslides, a score of 58.03 was obtained; and for the 6th question regarding the impact of landslides, a score of 48.21 was obtained.
Analysis of students' level of knowledge about landslide disasters is divided into three categories, namely low, medium, and high. For the first question about understanding landslides as much as 21.43% of respondents were in the low category, 67.85% of respondents were in the medium category, and 10.71% of respondents were in the high category. For the second question about the trigger of landslides as much as 46.42% of respondents were in the low category, 35.71% of respondents were in the medium category, and 17.86% of respondents were in the high category. For the third question about the initial symptoms / signs of soil movement or landslides as much as 0% of respondents are in the low category, 78.57% of respondents are in the medium category, and 21.43% of respondents are in the high category. For the fourth question about the characteristics of landslide-prone areas as much as 64.28% of respondents were in the low category, 0% of respondents were in the medium category, and 35.71% of respondents were in the high category. For the fifth question about the factors causing landslides as much as 10.71% of respondents were in the low category, 50.00% of respondents were in the medium category, and 39.28% of respondents were in the high category. For the 6th question about the impact of landslides as much as 32.14% of respondents were in the low category, 42.86% of respondents were in the medium category, and 25.00% of respondents were in the high category.

Analysis of students' knowledge of the factors causing the highest category landslides with an average value index of 58.03. This is because respondents have understood several things that can cause landslides, which can be caused by natural factors such as high rainfall and also human factors that are carrying out construction with too large a load. For the knowledge of students who are in the lowest category, namely the initial symptoms of landslides with an average value index of 31.25. This is because the attitude of not caring about the threat of landslides. It was evident from the community that they were still building residential buildings in hilly areas which the government had banned through warnings that the surrounding area was an area prone to landslides seen from billboards on the side of the road. But in fact, there are still many houses found there.

3.2 Initial ability of learners on aspects of Skills
The results of analysis of student skills against landslides are divided into 3 indicators, namely skills before landslides occur, skills during landslides, and skills after landslides are shown in Table 2.
Table 2. analysis of students' skills of landslides

| Indicator                          | Mean (\(\bar{x}\)) | Std. Deviation (SD) | Percentage responden |
|------------------------------------|---------------------|---------------------|----------------------|
|                                    |                     |                     | Low \((\bar{x} - 0.5 \text{ SD})\) | Medium \((\bar{x} - 0.5 \text{ SD} < x < \bar{x} + 0.5 \text{ SD})\) | High \((\bar{x} - 0.5 \text{ SD})\) |
| Skills before landslides occur     | 74.77               | 19.36               | 17.86                | 42.86                   | 39.28               |
| Skill during landslides            | 65.68               | 19.69               | 21.43                | 50.00                   | 28.57               |
| Skills after landslides            | 66.56               | 16.57               | 18.86                | 57.14                   | 25.00               |

Number 1 indicator students have skills before landslides occur with an average value of 74.77; number 2 indicator students have skills when landslides occur with an average value of 65.68; indicator number 3 students have skills after landslides occurred with an average value of 66.58.

Analysis of students' skills about landslides is divided into three categories: low, medium, and high. For indicator 1 regarding skills before landslide occurred 17.86% of respondents were in the low category, 42.86% of respondents were in the medium category, and 39.28% of respondents were in the high category. For indicator 2 about skills when landslides occur 21.43% of respondents are in the low category, 50.00% of respondents are in the medium category, and 28.57% of respondents are in the high category. For indicators 3 skills after landslides occurred 18.86% of respondents were in the low category, 57.14% of respondents were in the medium category, and 25.00% of respondents were in the high category.

The first indicator occupies the highest position, namely the action before the occurrence of landslides. Because students already know how to find shelter when landslides occur, students train themselves and family members about things to do when landslides occur, students discuss with all
family members, places where family members will gather after a disaster, students prepare bags disaster warning that contains the needs needed. The lowest student skills are skills when landslides occur. This is because people tend to panic when landslides occur.

In the implementation of education required adequate facilities to support learning activities, one of which is teaching materials. Teaching materials are anything that can be used as a guide or reference to facilitate students in understanding the material being studied, both written and unwritten material create an atmosphere that allows students to learn. The integrated teaching materials of landslide disaster will make it easier for students to understand the material about the landslide. According to the function of teaching materials for students is students can learn without having any educator or other parties, students can learn anytime and anywhere, students can learn at their own pace and choice along students can direct all activities in the learning process which is the substance of competence that should be studied or mastered.

4. Conclusion
In general, the initial ability of students is in the medium category, both for aspects of knowledge or skills. With an average value index for all questions on aspects of knowledge 43.87; the average value index for the skill aspect is 69.01. This position is at the second level of students' ability to landslide under the high category. The area of the school's environment is in areas with a high level of vulnerability so that it is needed for students to gain knowledge and skills in landslides. Subsequent studies should focus on developing an integrated landslide teaching material to improve students' ability to landslide.

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