The analysis of high school student’s preparedness to earthquake disaster

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Abstract. A large earthquake has occurred several times in the area of West Sumatra. At present, the potential for earthquakes still threatens the area of West Sumatra. The risk of earthquake disaster can be minimized by mitigating disasters. Mitigation is an effort made to reduce and minimize the consequences of disasters, which include preparedness, alertness and ability. The integration of earthquake disaster material with teaching materials is one of the effective steps in disaster mitigation efforts in the education field. One of the right teaching materials to use in the modern and technologically advanced era is electronic book (e-book). The purpose of this study was to determine the preparedness of students facing earthquake disasters as a preliminary study for the development of high school physics e-book on the theme of earthquakes. This research uses a descriptive method. The study subjects were SMAN 1 Sawahlunto students. The data of the study are primary data obtained from questionnaires using the Likert scale. This study indicates that it is necessary to develop physics e-book on earthquake themes to improve students' preparedness in facing earthquake disasters.

1. Introduction

An earthquake is a propagation of vibrations that occur on the surface of the earth due to the release of energy from the inside suddenly. In general, earthquakes occur as a result of the release of energy produced by pressure caused by the movement of the earth's plates. Indonesian territory is between the three plates of the world, namely Europe, Indo-australia and the Pacific. This condition causes Indonesia to be an earthquake prone area including one of which is the region of West Sumatra. Earthquake catalog data Meteorological climatology and geophysics agency shows that there have been several significant and destructive earthquakes in the western Sumatra region in the past decade [1]. The earthquake is predicted to still threaten the West Sumatra region in the future.

Earthquake disasters cause damage and impacts on both physical and psychological life. Earthquake vibrations cause damage to buildings, threats to survival to human casualties. Psychologically, earthquakes cause anxiety and high mental trauma, especially children, including students. Students affected by the earthquake have many cognitive problems such as lack of concentration, problems of learning activities, and the behavior of refusing to come to school [2].

Earthquakes include natural disasters that cannot be ascertained when and where they occur. However, the risk of earthquake disaster can be minimized by mitigating disasters. Mitigation is an effort made to reduce and minimize the consequences of disasters, which include preparedness and
preparation of physical preparedness, alertness and capability [3]. Disaster mitigation activities are carried out through (a) the implementation of spatial planning; (b) development arrangements, infrastructure development, building management; and (c) the implementation of education, counseling and training both conventionally and modernly [4].

There are many mitigation activities. The most strategic one is learning or education to the community. Education is an effective vehicle for building community behavior in the face of disasters. In the field of education, disaster mitigation efforts can be carried out through the integration of disaster knowledge into the education curriculum in schools so that it can improve disaster preparedness. Disaster knowledge has a relationship to preparedness and there should be integration of lessons about disaster in the curriculum [5].

Integration of earthquake disaster material can be done on physics teaching materials such as a book. The integrated science textbook theme earthquake can increase student’s knowledge, competence of responsiveness and skill [6]. One of the physics teaching materials that can be used along with the development of technology today is an electronic book (ebook). Electronic books are textbooks that are converted into digital formats. Ebooks have advantages compared to printed books, as they are simpler, cheaper and easier to obtain. Another advantages of ebooks are that they are more durable because they can be operated through digital devices such as computers or laptops and the appearance of ebooks is more attractive than printed books [7]. E-books are very practical to use in learning because the easy way to access e-books and the interesting e-book display [8].

The students are expected to be quicker and easier to understand efforts to reduce disaster risk by using ebook in physics learning. They are also hoped can play an important role in saving lives and protecting family members, communities during disasters. So students have disaster preparedness earthquake eventually.

In the face of the threat of an earthquake, preparedness is the key to safety. Preparedness is a series of activities carried out to anticipate disasters through organizing and through effective and efficient measures [4]. Many preparedness efforts can be made in various disaster situations. Some important efforts for preparedness are (1) Understanding hazards in the surrounding environment, (2) understanding the local early warning system, knowing evacuation routes and evacuation plans, (3) having the skills to evaluate the situation quickly and taking action initiatives to protect themselves, (4) Having a plan anticipating disasters for families and practicing those plans with practice, (5) reducing the impact of hazards through mitigation exercises and (6) involving themselves in participating in training [9].

Preparedness is an important attitude in dealing with earthquake disasters. Preparedness for facing earthquake disasters needs to be trained and prepared by students. For this reason, it is necessary to analyze the preparedness of students for earthquake disasters. In this study the results of the analysis can be used as a basis for developing ebook physics that integrates earthquake disaster material.

2. Research Method

The research method used is descriptive analysis. Descriptive research is a form of research that aims to describe a condition as it is. Descriptive research does not provide manipulation, treatment or use independent variables. Description of an object is done by using the numbers to be analyzed in order to obtain a conclusion [5].

The study population was the tenth grade students of Sawahlunto High School. The research sample was class X MIPA 4 which amounted to 32 people. The questionnaire was used to collect data in this study. The questionnaire contains questions related to the research title. The instrument used to collect data is the preparedness questionnaire of students facing earthquake disasters. The questionnaire used is in the form of a closed questionnaire whose answer has been provided in a range of 1 to 4. The answer is strongly agreed or always with a score of 4, Agree or often with a score of 3, Less Agree or sometimes with score 2 and Disagree or never with score of 1.

Analysis of preparedness data of students facing earthquake disasters through the following steps:

- Sum all scores obtained from each indicator
• Determination of the value of each indicator in the following way

\[ \text{Value} = \frac{\text{Total score}}{\text{Highest score}} \times 100 \]  

(1)

• Determine criteria or category

The category for each value obtained after processing data are as shown in Table 1.

| No | Value | Category          |
|----|-------|-------------------|
| 1. | 0 – 49| Not Prepared      |
| 2. | 50 – 59| Less Prepared    |
| 3. | 60 – 79| Sufficiently prepared |
| 4. | 80 – 100| Really Prepared |

### 3. Results and Discussion

On average, the preparedness of all students facing the earthquake disaster is still in the sufficient category. The results of the analysis of students’ preparedness facing the earthquake can be described as follows.

Based on Figure 1, 50% of students are less prepared to face earthquakes with an average value of 57.5 and 50% are sufficiently prepared with an average value of 65.9. While, there are no students in not prepared and really prepared category. Overall the average preparedness of students is 62.61.

Preparedness analysis of students facing earthquake disasters consists of 6 Indicators namely 1) understanding hazards in the surrounding environment, 2) understanding the local early warning system, knowing evacuation routes and evacuation plans, 3) having the skills to evaluate the situation quickly and take action initiatives to protect themselves, 4) have a disaster anticipation plan for the family and practice the plan with practice, 5) reduce the impact of hazards through mitigation exercises and 6) involve themselves by participating in training. The value of preparedness of students facing earthquake disasters on each indicator can be described as follows.
Based on Figure 2, the preparedness of students in indicator having the skills to evaluate the situation quickly and take the initiative to protect themselves has the highest value that is equal to 72.18, followed by indicator of reducing the impact of hazards through mitigation exercises with a value of 71.35. The lowest value is in the indicator of having a disaster anticipation plan for the family and practicing the plan with training that is equal to 35.74 and followed by aspects of involvement with participating in training with a value of 41.15.

The percentage of the number of students and their categories on each indicator are as follows:

| Indicator                                                                 | Value of each indicator | Percentage of students |
|---------------------------------------------------------------------------|-------------------------|------------------------|
| **Understanding hazards in the surrounding environment.**                 | 63.02                   | Not Prepared 68.75      |
| **Understanding the local early warning system, knowing evacuation routes**| 63.35                   | Less Prepared 31.25     |
| and evacuation plans**                                                    |                         | Sufficiently Prepared   |
| **Having the skills to evaluate the situation quickly and take action**   | 72.18                   | Really Prepared 0.00     |
| **initiatives to protect themselves**                                     |                         |                        |
| **Have a disaster anticipation plan for the family and practice the**     | 35.74                   |                        |
| **plan with practice**                                                    |                         |                        |
| **Reduce the impact of hazards through mitigation exercises**             | 71.35                   |                        |
| **Involve themselves by participating in training**                       | 41.15                   |                        |

**Figure 2.** Preparedness Value of Students Face Earthquake Disasters On Each Indicator

**Table 2.** Results of Preparedness Analysis of students facing earthquake disasters (N=32)
Based on Table 2, the indicators of understanding hazards in the environment 68.75% of students are in the category of less prepared and the rest in the category are sufficient prepared. In the indicators of understanding the local early warning system, knowing evacuation routes and evacuation plans, 59.374% of the students in the category were sufficient prepared, 6.25% were really prepared, 31.25% were less prepared and 3.125% of students did not have preparedness in this indicator. Students also have an unprepared category of 3.125%, 87.5% are sufficient prepared and the rest are really prepared in the indicator to have the skills to evaluate the situation quickly and take action initiatives to protect themselves. Most students do not have plans for disaster anticipation for families and practice the plan with practice, only 6.25% of students have preparedness in this indicator and that is only in the less prepared category. Half of the students are sufficient prepared in the indicator to reduce the impact of hazards through mitigation exercises, 28.125% are really prepared and 21.875% in the less prepared category. More than half of the students have not yet involved themselves in participating in mitigation training, which amounted to 68.75%, 28.125 less and only 3.125% in the sufficient category.

4. Conclusion
Based on the results and discussion, it can be stated that the preparedness of the students of SMAN 1 Sawahlunto facing an earthquake is still sufficient prepared. So it can be concluded that there is a need to develop integrated physics teaching materials for earthquake disasters such as electronic books to improve the preparedness of students to face earthquakes.

References
[1] Badan meteorologi klimatologi dan geofisika. 2018. *Katalog Gempa Bumi Signifikan dan Merusak* 182 - 2017.
[2] Thoyyibah Z dkk. 2019. *Gambaran Dampak Kecemasan dan Gejala psikologis Pada Anak Korban Bencana Gempa Bumi di Lombok*. Journal of Holistic Nursing and Health Science Volume 2, no. 1.

[3] Keputusan Menteri Dalam Negeri RI No. 131 Tahun 2003.

[4] Undang-Undang Republik Indonesia No 24 tahun 2007 Tentang Penanggulangan Bencana.

[5] Nurdin A dan Chairummi. 2019. *Peningkatan Pengetahuan Kesiapsiagaan Bencana dan Konsep Diri Terhadap Gempa Bumi Siswa*. Jurnal Dediaksi Pendidikan Vol. 3 No. 2. Universitas Abulyatama.

[6] Rustam N I, Fauzi A and Syafriani. 2019. *Effectiveness of Integrated Science Textbook Theme Earthquake Using Connected Model SSCS Problem Solving*. IOP Conf. Series: Journal of Physics: Conf. Series 1185 (2019) 012092 doi:10.1088/1742-6596/1185/1/012092.

[7] Via Wulandari, Abidin Zainul dan Henry Praherdhioni. 2019. *Pengembangan Media pembelajaran E-book Infografis Sebagai Penguatan Kognitif Siswa X MIA*. Jurnal Kajian Teknologi Pendidikan Vol. 2 No. 1. Universitas negeri Malang.

[8] Hartiningrum Y. 2019. *Kelayakan Empiris E-book Berbasis Hots Pada Materi Pembelahan Sel Untuk Melatihkan Keterampilan Berpikir Tingkat Tinggi Kelas XII SMA/MA*. Jurnal Berkala Ilmiah Pendidikan Biologi Vol. 8 No. 2. Universitas negeri Surabaya.

[9] Badan Nasional Penanggulangan Bencana. 2019. *Tanggap Tangkas Tangguh Menghadapi Bencana*.

[10] Nana S. 2011. *Metode Penelitian Pendidikan*. Bandung: Remaja Rosdakarya.