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The Student's Knowledge of Volcanic Eruption Mitigation in Magelang Regency

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ABSTRACT
This study aims to determine the level of student's about Volcanic Eruption Mitigation in Magelang Regency. This research is a survey. The sample of this research is 92 students class VII and VIII SMP Negeri 3 Muntilan and SMP Negeri 1 Kota Mungkid, Magelang Regency. Sample were taken using simple random sampling. The instrument is a question consisting of 10 items on the mitigation of volcanic eruptions. The distribution of data is valid, and reliable based on analysis using IBM SPSS Statistics 22 software.The results of this study indicate that students of class VII and VIII of SMP Negeri 3 Muntilan and SMP Negeri 1 Mungkid City a good knowledge about volcanic eruption mitigation with percentage 62.64%.

Keywords: *Disaster knowledge, Disaster mitigation, Volcanic eruption*

1. INTRODUCTION

Natural hazards such as volcanic eruption, tsunami, and earthquake have been part of Indonesia living condition since it's located in the ring of fire. Indonesia has 127 active volcanoes [9]. Based on the data of National Disaster Management Agency, in the period 2011-2019, the most volcanic eruptions occured in 2018 with 58 incidents. Some of volcanoes that experienced eruptions were Anak Krakatau Volcano, Sinabung Volcano, Merapi Volcano, and others. The biggest Merapi Volcanic Eruption in October 2010 ranked third in the world in terms of impact [4] and it claimed at least 386 people were killed and more than 300.000 people evacuated [8].

Merapi volcano eruptions dominated by pyroclastic flows caused by the collapse of the lava dome [6]. Pressure from inside the volcano presses and powers the explosive phase of the eruption with a large amount of volatile-rich magma from a depth of 5-30 km [10]. The area in the eruption area was covered by volcanic ash and several facilities such as infrastructure, rural areas, economic activities and educational activities were destroyed.

The occurrence of a disaster can directly affect the education aspect, especially education in disaster-prone areas. There were many negative impact from Merapi Volcano eruption. the first is that some students and teachers have become victims, many students have been displaced for a long time, school facilities have been destroyed and cannot be used anymore, and the last there are schools that have been turned into refugee barracks. The most psychological impact was the existence of trauma for students who have to face the disaster without having the knowledge to carry out mitigation.

Disasters are understood to be critical events, are widespread, and follow unusual procedures. The planning process for communities at risk of disasters must be continual and challenging [7]. A disaster also needs to be integrated in school to develop the student's disaster knowledge. Disaster knowledge can help address the four key areas of disaster management cycle : mitigate, prepare, respond, and recover (Figure 1). An understanding of disaster management must be possessed by communities living in disaster areas. The characteristics of disaster management are related to the time scale, pressure, activities, actors involved, and stakeholders in activities and a system. [14].

Figure 1. Disaster Management Cycle.

One part of the disaster management cycle is mitigation. Disaster mitigation is efficient and effective to minimize the risk of death and material losses also reduce the impact of disaster [1]. Disaster mitigation through education aims to foster preparedness knowledge and prepare people to get used to living together with disasters. Disaster mitigation can be implemented in science learning at the junior high school level, in line with the contents of Law no. 24 of 2007 that there needs to be an integration between disaster management and development programs, which includes the education sector.

The research about disaster education in merapi volcano that have done indicates Pre-disaster, disaster, and disaster knowledge is provided through an educational process that can be carried out in community activities. Knowledge of disasters through the role of local wisdom that owned by the community is relatively poor [5]. Barriers to hazard preparedness are usually psychological, for example regarding risk perception, coping capacity, self-efficacy or self-esteem. Barriers can also arise from social factors and social norms, or resource constraints that can prevent an individual from preparing for threats.

Disaster mitigation education in Indonesia is one of the basic life skills. Disaster mitigation education is integrated into teaching and learning activities without going through special subjects and requires the involvement of all parties, including schools, parents, communities and the government. Research shows that students class VIII SMP around Merapi Volcano had a good knowledge about knowing the danger sign of eruption by 29% and had a ready for disaster preparedness of 59%.

Knowledge about volcanic eruption disaster mitigation is very urgent for the residents of the mountain slopes. Students become targets who are expected to have strong disaster knowledge in order to become educational agents in their area. Based on these problems, this study aims to know student's level of Student's Knowledge of Volcanic Eruption Mitigation in Magelang Regency.

2. RESEARCH METHOD

This research is a survey to determine student's knowledge about mitigating volcanic eruptions. These multiple choice questions was administered to students who lives in the area that affected by the eruption of Merapi Volcano in Magelang Regency. Participants were shown a questions consisted of 10 items with 4 answer options (a,b,c,d) that have been validated with statistical analysis by IBM SPSS Statistics 22 software. The questions indicate the knowledge about disaster mitigation. This study was conducted in SMP N 3 Muntilan and SMP N 1 Kota Mungkid in Magelang Regency.

The sample in this research is 82 students class VII and VIII SMP Negeri 3 Muntilan and SMP Negeri 1 Kota Mungkid. Respondents were recruited using a simple random sampling method. Each case population in a simple random sampling has an equal probability of being included in the sample[11]. The research was between 8 - 20 October 2020.

Data analysis in this study used (a) qualitative data analysis techniques by collecting statements selected by respondents on a scale of 1 (low) to 4(very good), (b) qualitative data analysis techniques are converted to quantitative data with the conditions very good: 4, good: 3, sufficient: 2, and low: 1. The data from analysis of student's answer then calculating by dividing the total scores with the maximum scores. In percentage it is expressed by equation 1:

$$P = \frac{A}{B} \text{ x } 100\% \quad (1)$$

With:

P = Percentage

A = Scores obtained

B = Ideal scores

After the data analysis result calculate using interval equations. The category can be seen in Table 1.

Table 1. Category of knowledge of disaster mitigation [13].

Interval Score (%)	Category
81 – 100	Very good
61 – 80	Good
41 – 60	Sufficient
21 – 40	Low
0 – 20	Very Low

3. RESULTS AND DISCUSSION

Volcanic eruptions, whether effusive or explosive, have significant impacts on their surroundings [2]. Disaster management is needed by the community to deal with volcanic eruption disasters that can occur at any time. Disaster management takes a long time for communities to understand. Disaster management also requires detection of critical events in order to provide early response time and effective mitigation.

The number of disasters in Indonesia increases every year so that disaster mitigation becomes a priority program for disaster-prone areas. Understanding disaster mitigation is the ability to understand disaster risk reduction efforts with the aim of reducing long-term disaster risk, reducing casualties, and minimizing the impact of a disaster.

Science learning is one of subject that includes disaster knowledge in its basic competence. Spesifically, science learning in junior high school loads disaster material in the structure and dynamics of the earth.To know how student's knowledge about volcanic eruption mitigation then a research must be carried out for students who live in prone areas of volcanic disasters. The student's knowledge on volcanic eruption mitigation measured with 10 multiple choice questions that have been validated by IBM SPSS Statistics 22 software using Spearman correlations with the results shows in Table 2.

Table 2. Results of question validation

No Items	Sig.(2-tailed)	Summary
1	.000	Valid
2	.004	Valid
3	.000	Valid
4	.005	Valid
5	.002	Valid
6	.001	Valid
7	.004	Valid
8	.001	Valid
9	.004	Valid
10	.000	Valid

Table 2 indicates that all of the questions is valid because the significance score (2-tailed) < 0,05. In addition to validation, the questions were also tested for reliability using IBM SPSS Statistics 22 software with the results shows in Table 3.

Table 3. Results of question reliability

Cronbach's Alpha if Item Deleted	R table	Summary
0,547 – 0,598	0,1829	Reliable

Table 3 shows that all the Cronbach's alpha value > R table (0,1829) and it means sufficient reliability. Before testing the validity and reliability, the questions were done by the students. The multiple choice questions used to measure the student's knowledge on volcanic eruption mitigation that develop using the indicators: disaster mitigation understanding, disaster mitigation purposes, vulcanic eruption hazard maps, volcano's level activity, volcano eruption alert, disaster mitigation stages : pre-disaster, syn-disaster, and post-disaster, evacuation symbols, evacuation action factor, and Indonesian mitigation program. The percentage data of about student's knowledge of vulcanic eruption mitigation can be seen in Table 4.

Table 4. Student's *knowledge of vulcanic eruption* mitigation

No	Items	(%)	Category
1.	Knowing that disaster mitigation is the efforts to reduce disaster risk through physical development and increasing the capacity of the community.	57.7	Sufficient
2.	Recognizing that long-term disaster	56.59	Sufficient

No	Items	(%)	Category
	risk reduction, reducing casualties, and minimizing impact are the aims of disaster mitigation.		
3.	Knowing the color difference of the volcanic eruption hazard map.	79.32	Good
4.	Knowing the different levels of volcanic activity (*normal, waspada, siaga, awas*)	59	Sufficient
5.	Knowing the early warning of volcanic eruptions	39.51	Low
6.	Knowing the mitigation before disaster occur (pre-disaster).	78.32	Good
7.	Knowing the mitigation when disaster occur (syn-disaster).	79.19	Good
8.	Knowing the meaning the symbol of evacuation route.	77.97	Good
9.	Knowing the interactions in emergency situations.	39.78	Low
10.	Knowing the model of volcanic eruption mitigation programs in Indonesia.	58.97	Sufficient

Japan and Indonesia are among the countries that are in the circle of fire with earthquake points that are scattered in almost all regions. However, Japan realizing its position and made efforts to prevent casualties and material damage by making disaster-resilient urban design. The coexistence of preserving cultural values and mitigating disasters towards disasters in the future are the characteristics of disaster-resilient urban design. [12]. Besides disaster-resilient urban design, Japan is also developing a rescue robot and system. Robots carry out their duties at the disaster site for the evacuation, search and detection process at the World Trade Center building which collapsed in September 2001 [3].

Sophisticatedly disaster mitigation efforts in Japan directly affect the understanding of disasters and preparedness by the community. Meanwhile in Indonesia, especially in the disaster-prone areas of Merapi Volcano in Magelang can be seen in Table 4. The result about student's knowledge of vulcanic eruption mitigation indicates 4 items meet a good category, 4 items meet sufficient category, and 2 items meet low category. The good category represents that the students already have the knowledge about the color difference of the volcanic eruption hazard map, knowing the disaster mitigation, and knowing the meaning of the evacuation symbol around them and knowing the model of volcanic eruption mitigation program in Indonesia such as *SekolahSiagaBencana*.

The sufficient category indicates that student's knowledge about the aims of disaster mitigation, level of volcanic activity (*normal*, *waspada*, *siaga*, and *awas*), and model of volcanic eruption mitigation programs in Indonesia is stillneeds to be improved by strengthening the integration between disaster knowledge and science subjects. There are 2 items are in the low category, it indicates that the students have a low knowledge about the early warning of volcanic eruptions and the interactions in emergency situations. It becomes urgent homework, because the knowledge contained in these items is the key that determines the evacuation action taken when disaster occurs. From Table 4, it can be concluded by calculating the average percentage that students' knowledge of volcanic eruption mitigation is equal to 62,64% with a good category.

The average results show that the students of SMP Negeri 1 Kota Mungkid and SMP Negeri 3 Muntilan have good knowledge about the volcanic eruptions mitigation. Geographically, SMP Negeri 1 Kota Mungkid is in a radius of 36 km and SMP Negeri 3 Muntilan is in a radius of 29 km fromMerapi Volcano. SMP Negeri 1 Kota Mungkid and SMP Negeri 3 Muntilan have a good knowledge about volcanic eruptions mitigation because theri areas are affected when an eruption occurs. The school is affected by volcanic ash carried by the air,

close to a river of lava flow from Merapi Volcano, and belong to one refugee area for communities who lives in the slopes of Merapi Volcano.

The Sendai Framework by United Nations (UN) have 4 priority due for action, and disaster mitigation is part of it. Adoption of measures to address three dimensions of disaster risk (hazard exposure, vulnerability and capacity, and hazard characteristics), prevention of new risk creation, reduction of existing risks, and enhancement of resilience, these four steps are the focus of the Sendai Frameworks. [15].

Disaster knowledge indirectly affects the resilience of the country and disaster mitigation capability is an investment for every individual. The higher the knowledge and capacity of disaster mitigation, the smaller the number of victims when a disaster occurs. In an effort to support increased knowledge and capacity about volcanic disasters and their mitigation, there are two recommendations to be implemented. The first recommendation is the integration of disaster knowledge and mitigation in science subjects. The second is contribution of all elements on disaster mitigation education and nature conservation.

4. CONCLUSION

Disaster learning in the context of disaster mitigation should involve the domains of knowledge, attitudes and practices.The finding of this study indicates that students class VII and VIII SMP Negeri 3 Muntilan dan SMP Negeri 1 Kota Mungkid had a good knowledge about volcanic eruption mitigation with percentage 62,64%.

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