

## Earthquake Disaster Education to Students of Senior High School Using Role Playing Learning Model

Siti Asiah<sup>1\*</sup>, Tuti Supriyanti Asofi,<sup>2</sup> Dewi Liesnoor Setyowati<sup>3</sup>, Erni Suharini<sup>4</sup>, Mohmadisa Hashim<sup>5</sup>, Nasir Nayan<sup>6</sup>

<sup>1,2,3,4</sup>Universitas Negeri Semarang, Indonesia

<sup>5,6</sup>Universiti Pendidikan Sultan Idris, Malaysia

\*email: [asiahsiti31@students.unnes.ac.id](mailto:asiahsiti31@students.unnes.ac.id)

### ABSTRACT

*The aims of this study are 1) to analyze earthquake disaster education in State Senior High School 1 Karangreja, using a role-playing learning model.; 2) to analyze the knowledge and students' attitude in dealing with earthquakes. The population of this study was all students of State Senior High School 1 Karangreja. State Senior High School 1 Karangreja is located on the slopes of Mount Slamet, making it prone to volcanic earthquakes. Disaster education for students is very needed. This will allow the students to have provisions when a disaster occurs. The number of samples is 56 respondents. The data collection techniques used are questionnaires, interviews, and documentation. The data analysis technique in this research is descriptive quantitative. The result of this study is that the condition of teachers in providing education about earthquake disasters is still at the stage of offering knowledge; there needs to be simulation practice involved. The level of preparedness knowledge of students with moderate levels of knowledge is 66% of respondents. Students with low levels of preparedness knowledge are as much as 16%. Students with an excellent preparedness attitude are as much as 52%. Researchers advise the school and the teachers to improve education on disasters, particularly earthquakes, based on the disaster vulnerability at the school.*

### Keywords:

Knowledge; Attitude; Preparedness; Earthquake

### ABSTRAK

*Tujuan dari penelitian ini adalah 1) Menganalisis edukasi bencana gempa bumi di SMAN 1 Karangreja melalui model pembelajaran role playing; 2) Menganalisis pengetahuan dan sikap siswa dalam menghadapi bencana*

*gempa bumi. Populasi penelitian ini adalah seluruh siswa SMAN 1 Karangreja Kabupaten Purbalingga. Hal ini karena berada di lereng Gunung Slamet sehingga rawan akan bencana gempa bumi vulkanik. Edukasi kebencanaan pada siswa sangat diperlukan agar siswa memiliki bekal ketika bencana itu terjadi. Jumlah sample 56 responden. Teknik pengumpulan data adalah kuisioner, wawancara dan dokumentasi. Teknik analisis data dalam penelitian ini adalah deskriptif kuantitatif. Hasil dari penelitian ini yaitu kondisi guru dalam memberikan edukasi kebencanaan gempa bumi baru pada tahap memberikan pengetahuan belum ada praktek simulasi. Tingkat pengetahuan kesiapsiagaan pada Siswa di SMAN 1 Karangreja rata-rata memiliki pengetahuan yang sedang yaitu 66% siswa, sedangkan yang memiliki pengetahuan yang rendah yaitu 16%. Siswa SMAN 1 Karangreja rata-rata memiliki sikap kesiapsiagaan yang sangat baik yaitu 52%. Saran untuk sekolah dan guru terutama untuk guru geografi, perlu peningkatan edukasi kebencanaan khususnya terkait bencana gempa bumi sesuai dengan kerentanan bencana di sekolah.*

***Kata kunci:***

Pengetahuan; Sikap; Kesiapsiagaan; Gempa Bumi

## **1. Introduction**

Indonesia is one of the countries with a relatively high vulnerability to natural disasters. Disasters happen occasionally and harm human life (Yulianto, et., al, 2021). This condition is triggered by Indonesia's tectonic location at the confluence of three world tectonic plates (Eurasia, Indo-Australia, and the Pacific Plates). Volcanically, Indonesia is also located on an active volcanic path known as the Pacific Ring of Fire (Hermon, 2014). This condition leads Indonesia to have a relatively high frequency of earthquakes. This disaster will be very detrimental if it occurs at a certain distance with a certain vibration. In the last ten years (i.e., from 2009 to 2019), earthquakes have occurred 216 times, with the number of missing and dead as many as 637 people, 8,687 injured, 459,855 refugees, 602,223 damaged houses, and 131 public facilities (BNPB, 2019). In this case, we should consider that the earthquakes that occur in almost all parts of Indonesia, some even accompanied by a tsunami, are a real threat faced by the Indonesian people (Kemhan, 2015).

Disaster preparedness is a real need in this nation, especially for earthquakes. It can be understood as activities to deal with disasters and emergencies and a framework for relief and recovery for communities affected by disasters (Kurniyanti, 2012). In disaster preparedness, rehabilitation is an immediate repair that is needed, which is temporary or short-term. Meanwhile, reconstruction is a permanent repair. These stages are needed to organize effective and efficient steps to avoid a disaster or overcome the impact if a disaster occurs (Srihariyani, 2010; Kurniyanti, 2012; Kusumasari, 2014). Meanwhile, according to Law number 24 of 2007 above, it is explained that implementing disaster management is a series of efforts that include establishing policy development that poses a risk of disaster, disaster prevention activities, emergency response, and rehabilitation.

Historically, the results of data calculation from DesInventar and IRBI show that 16 of the 34 provinces in Indonesia have disaster risks that are included in the high category. At the same time, the rest are at moderate disaster risk. (BNPB, 2018). More specifically, Yulianto et al. (2021) provide details that historically, three central provinces had the highest disaster risks from 1815 to 2019, namely Central Java (7,113 events), West Java (4,693 events), and East Java (4,165 events). History also records that the disasters and the loss of life caused by them continue to increase in Indonesia (Sudibyakto, 2011). As a province with the highest disaster history, Central Java needs to build a disaster risk reduction system that cannot be separated from the role of all parties (Kurniasari, 2017).

The high number of casualties from natural disasters, especially earthquakes, indicates that community preparedness is still low in dealing with this disaster. One thing to answer this problem is that research and studies on preparedness must be improved and updated. Related to the subject in this study, State Senior High School 1 Karangreja, located on the slopes of Mount Slamet (Purbalingga, Central Java), faces serious disaster vulnerabilities and threats. This reminds the importance of disaster preparedness education, especially for all residents of State Senior High School 1 Karangreja.

Students and school residents of State Senior High School 1 Karangreja must understand disaster management. One of the efforts at disaster management understanding is through disaster education and by integrating it with the curriculum in the education unit (Suprpto, 2020). Based on the academic aspect, State Senior High School 1 Karangreja has provided a disaster education and integrated it into geography subjects in classes X and XI according to the curriculum, namely Basic Competencies number 3.7 (Analyzing types and natural disaster management through education), local wisdom, and the use of modern technology, as well as according to Basic Competencies number 4.7 (Making sketches, floor plan, and map of local area disaster potential as well as disaster mitigation strategy based on the map). The earthquake disaster education learning model, which has been applied to students of State Senior High School 1 Karangreja, is the Role Playing learning model or role-playing using media of animated videos about disasters, pictures, and evacuation route signs. Facts on the ground show that the school curriculum, apart from Geography, still needs to integrate disaster preparedness education as one of the learning contents. Even teachers still need to integrate disaster preparedness education into their teaching subjects. This encourages the urgent need for this integration since natural disasters, especially earthquakes, can occur anytime and cause casualties. The main goal is for the residents of State Senior High School 1 Karangreja to be ready and alert in dealing with disasters to reduce the impact of disasters, especially earthquakes.

The argument to be built in this research is that disaster preparedness is a basic need for every region to reduce disaster risk that can occur regardless of time and place in both formal and informal environments. This is because reducing the risk of an earthquake requires people to prevent it using the correct method. Thus, the risk of disasters, especially regarding human casualties, can be minimized. However, the prevention methods applied might be different in each region. The geographical location of the region influences it, as the familiar disasters that occur in the area and the community's social conditions. Hence, each region needs to study the correct method for dealing

with natural disasters. The role of disaster education which is as essential as the role of education in disaster reduction and mitigation has been recognized in the Sendai Framework For Disaster Risk Reduction, which is the first significant agreement by the United Nations (UN) organization (Hoffmann, Roman and Daniela Blecha, 2020). Schools, as learning institutions for students, should strive to secure and protect all students from various disturbances, including the possibility of disasters that can occur at any time.

The aims of this study are 1) to analyze how disaster education is in State Senior High School 1 Karangreja, Purbalingga Regency, through the Role Playing learning model and analyze the readiness of students in State Senior High School 1 Karangreja in dealing with earthquake disasters. The studied indicators are students' knowledge and attitudes in dealing with earthquake disasters.

## 2. Methods

The method applied in the research is the quantitative approach method. The research population was all students in State Senior High School 1 Karangreja, totaling 560 students. The determination of the number of samples was using Proportional Random Sampling by taking 10% of the total population so that 56 respondents were obtained. The sampling was determined using proportional random sampling since each student has the same opportunity and is adjusted to the proportion. Researchers took a sample of 10% of the total population since the number of the sample was less than 1000 respondents, so the research conducted is more representative. The first research variable is earthquake disaster education through the Role Playing learning model. The second variable is students' readiness to face earthquake disasters, with the indicators studied covering aspects of knowledge and aspects of students' attitudes in dealing with earthquake disasters. Data in this study were collected through documentation, interviews, and questionnaires. Interview with a geography teacher in State Senior High School 1 Karangreja was done via WhatsApp. Research data collection on students of State Senior High School 1 Karangreja was done online. The questionnaire data were collected through a Google form containing questions about knowledge about earthquake disasters and about students of State Senior High School 1 Karangreja's attitudes in dealing with earthquake disasters. The analytical method used in this study is analyzed using the percentage frequency with the following steps:

- (1) Availability of raw data collected from the field.
- (2) Raw data are arranged from the smallest value to the most significant value or vice versa.
- (3) The number expressing the data amount is called the frequency.
- (4) The percentage frequency is calculated using the following formula:

$$\text{Frekuensi Presentase} = \frac{\text{frekuensi class } i}{n} \times 100\%$$

Explanation:

Class i = Amount of data in a specific category

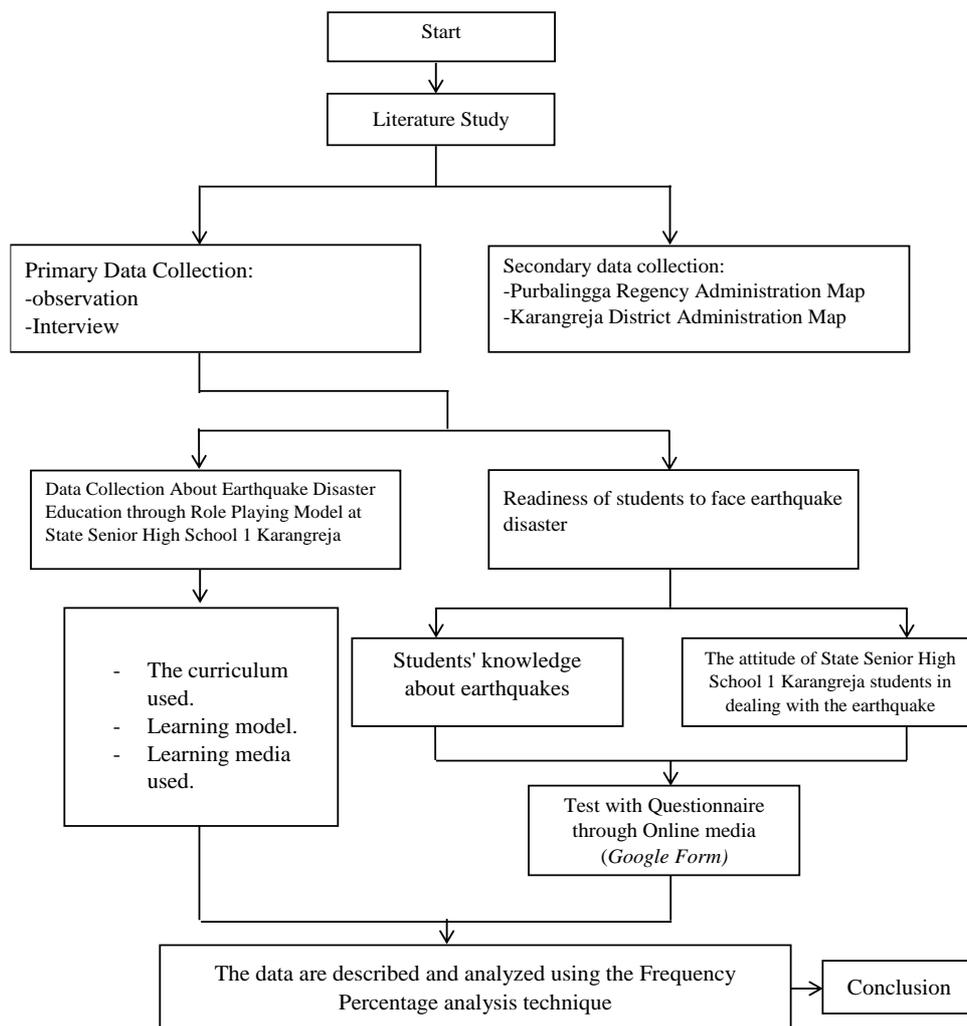
Nn = Total data

(5) Data is distributed in the form of tables. The general form of the frequency distribution table is as follows:

**Table 1.** Frequency distribution

No.	Class (Category)	Frequency
1	1st class/1st Category	F1
2	2nd class/2nd Category	F2
3	:	:
4	k class/k category	Fk
5	Total ( $\Sigma$ )	N

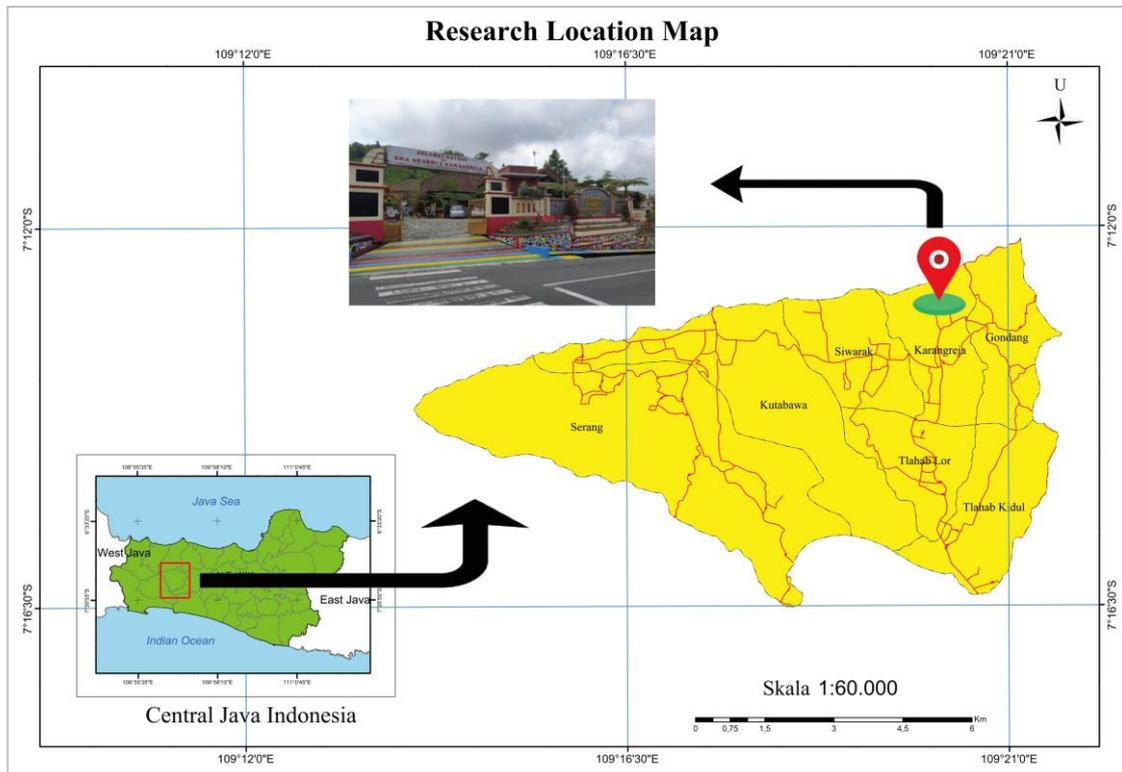
The Research Flow can be seen in the Figure.



**Figure 1.** Research Flow

This research is located at the State Senior High School 1 Karangreja, a state senior high school in the Karangreja District, Purbalingga Regency, Central Java Province. The boundaries of the Karangreja sub-district are in the north by Belik and Pulosari sub-districts, in the west by Karang

Jambu sub-districts, in the east by Pulosari sub-districts, and in the south by Bojongsari, Mrebet, and Bobotsari sub-districts. The research location can be seen in Figure 2.



**Figure 2.** Location: State Senior High School 1 Karangreja  
Source: Research data processing, 2021

State Senior High School 1 Karangreja is under the auspices of the Ministry of Education and Culture. State Senior High School 1 Karangreja was established on August 8, 2003, and based on the Accreditation Decree 220/BAP-SM/X/2016, the accreditation of State Senior High School 1 Karangreja is A. The number of students in State Senior High School 1 Karangreja is 560, with 16 classes consisting of Science and Social Science majors from Class X, XI, and Class XII. Meanwhile, the number of teachers in State Senior High School 1 Karangreja is 52 teachers.

### 3. Results and Discussion

#### 3.1 Earthquake Disaster Education Through Role Playing Learning Model

Disaster education is an important thing that needs to be made into a program by every school (Tong, Shaw, & Takeuchi, 2012; Zhu & Zhang, 2017). Therefore, it can be used to educate or to make students have an attitude of preparedness. Disaster education and simulation significantly increase community capacity in dealing with disasters (Setyowati., et al., 2021). Disaster education in schools is essential because children are part of a society that is very vulnerable to becoming victims affected by disasters. Children are the nation's hope for the future (Baytiyeh, 2018; Shah,

2020). Schools, as a center of learning activities, should also allow children to share the disaster education they get at school with the parents and the community (Okatari et al., quoted in Nifa et al., 2017).

Education on disaster needs to be carried out in formal and non-formal environments (K. Yamori, 2008). It is essential to shape students to have the knowledge and attitude to prepare for earthquakes. As a result, students can distribute the information they have obtained at school to their families. Through education on disasters from schools, students can influence creating well-prepared families whenever disasters occur. Education aims to build a culture that prioritizes several aspects of interest in a safe context for the community, school community, government, and other stakeholders (Maknun, 2017). The education on disaster also aims to equip students with knowledge, skills, and awareness so they can have a good capacity in disaster management in their area (Setyowati, 2020).

Disaster education in schools is essential because students are the future generation who have the potential to pass on the knowledge gained to their family members. Disaster education is essential; therefore, the education curriculum in schools must be adapted to the needs of students and current conditions (Galang, 2021). Thus, disaster education must be included in the education curriculum in Indonesia and integrated into all subjects. The importance of education on disaster encourages the integration of disaster mitigation into education in Indonesia (Suhariani & Baharsyah, 2020; Suharini, Ariyadi & Kurniawan, 2020). Looking at the condition of Indonesia, which is prone to disasters and the location is on an earthquake-prone route; the school must provide earthquake disaster mitigation-related learning materials so that students are prepared and become less vulnerable when a disaster occurs (Chai, 2021; Seddighia, 2021). Since the school learning activities are significant in achieving learning objectives adapted to the existing curriculum as a strategic step to create students who have disaster preparedness (Manesh., et al., 2016). State Senior High School 1 Karangreja has provided education on earthquake disasters in grades X and grade XI following the curriculum applied by the school, namely Basic Competence number 3.7 (analyzing the types and management of natural disasters through education of local wisdom and the use of modern technology and presenting certain disaster management concepts). In grade X, the earthquake disaster learning material is integrated with primary competence number 3.5 about Lithosphere, where the teacher provides knowledge to students about earthquake disasters, from the definition of earthquakes, the causes of earthquakes, how to mitigate when earthquakes occur at any time, to providing knowledge on how to reduce the risk impact of earthquake disasters.

The disaster education learning process in a class implements the educational curriculum. It is an effort to create common educational goals or aspirations to increase student awareness regarding earthquake disasters (Muslim, 2022). Therefore a teacher must be good at choosing interesting learning methods or models so that in the learning process, students become more enthusiastic while participating in the learning and teaching activities. The learning model applied in the earthquake

disaster education at State Senior High School 1 Karangreja is the Role Playing learning model. Through the Role Playing learning model, students' memory related to disaster simulations is more durable and imprinted so that students become responsive and ready when an earthquake occurs. The learning media used in the earthquake disaster education at State Senior High School 1 Karangreja are animated videos, pictures, and evacuation route signs. The evacuation route signs owned by State Senior High School 1 Karangreja can be seen in Figure 3.



**Figure 3.** Evacuation lane sign,  
Source: Research data processing, 2021

Based on Figure 1 above, the evacuation route sign at State Senior High School 1 Karangreja can be seen. Through the Role Playing learning model, students whom a geography teacher guided conducted earthquake disaster mitigation simulations starting from the sound of a siren signaling an earthquake played by the teacher; then, students simulated saving themselves by running out of the classroom; some were hiding under the table, while some role-played as victims of the earthquake disaster, some others became the SAR (search and rescue) team and the medical team. Through learning activities using the Role Playing learning model, students understand what to do when an earthquake occurs and can take appropriate action afterward. Another purpose of disaster simulation is to provide knowledge about disasters, increase awareness, examine preparedness procedures in disaster management, and minimize casualties (Gunawan et al., 2019). Disaster evacuation route signs are essential facilities and infrastructures that must be available at every school, especially for disaster-prone schools such as State Senior High School 1 Karangreja, prone to earthquakes. Signs for evacuation routes can help students evacuate and save themselves to a safe place when an earthquake occurs. When faced with a sudden earthquake, students' immediate response is panic and confusion, which causes many fatalities (Rozo et al., 2019). Evacuation routes can also minimize casualties (Gunawan et al., 2019).

### 3.2 *Students' Knowledge and Attitude in Dealing with Earthquake Disasters at State Senior High School 1 Karangreja*

#### 3.2.1 *Knowledge*

Knowing about earthquake disasters is essential to reduce vulnerability and minimize casualties caused by earthquake disasters. When students know about earthquakes, they will know what actions to take to save themselves if an earthquake occurs at any time (Alam, 2020). On average, based on the results of the data calculation, it was found that the knowledge of students in State Senior High School 1 Karangreja on earthquakes is moderate or as much as 66.1%. In other words, 37 respondents had a moderate knowledge of disasters. The lowest level of student knowledge about earthquakes is 16% or nine respondents, following the data presented in Table 2.

**Table 2.** Level of Knowledge

Score Interval	Percentage (%)	Criteria	F	%
9– 10	68 – 100	High	10	17,8
7– 8	34 – 67	Moderate	37	66,1
5– 6	0 – 33	Low	9	16,1
Total			56	100

Source: Research data processing, 2021

Various indicators are used to understand the level of earthquake disaster knowledge of students at State Senior High School 1 Karangreja. The indicators of earthquake knowledge are derived from the sub-variables of students' knowledge of earthquakes. The indicators of earthquake knowledge examined on the students of State Senior High School 1 Karangreja include knowledge about earthquakes during pre-disaster, disaster, and post-disaster. Hence, the indicators of the questions asked include comprehension of knowledge about earthquake disasters, potential earthquake threats, factors for earthquakes, knowledge about volcanic earthquakes, knowledge about the impact of earthquakes, and disaster mitigation efforts. There are ten questions given to students with indicators of knowledge which can be seen in Table 3.

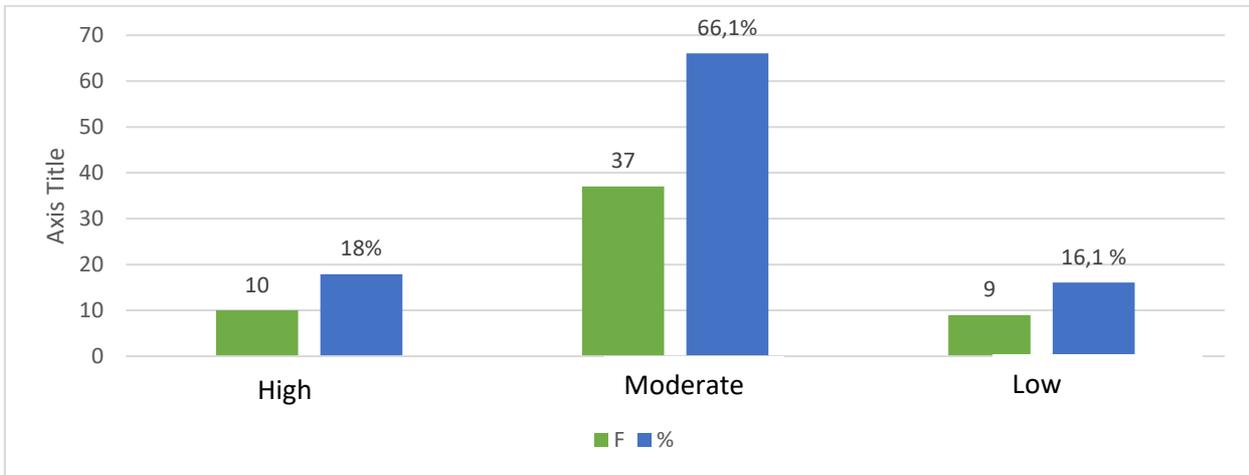
**Table 3.** Indicators of Knowledge Regarding Earthquakes of Students in State Senior High School 1 Karangreja

No.	Question Indicators	Score	%
1	Understanding about earthquakes	47	84
2	Potential threats of earthquakes	46	82
3	Factors that cause earthquakes	54	96
4	Pengetahuan tentang gempa vulkanik	55	98
5	Understanding the impacts of earthquakes	18	32
6	Knowledge about earthquake detector tools	27	48
7	Knowledge of when earthquakes occur	42	75
8	Knowledge of earthquake disaster mitigation	47	84
9	Earthquake disaster mitigation efforts	50	89
10	Efforts to mitigate earthquakes while indoors	30	54

Source: Research data processing, 2021

Based on the data regarding indicators of earthquake disaster knowledge about earthquake disaster as presented in Table 2, those who have the highest knowledge are 98% of the students. They already know about volcanic earthquakes; the second highest is that 96% of students already know

about the factors that cause earthquakes. The indicator of the earthquake impacts shows the lowest level of knowledge. The data calculation shows that only 32% of students know the earthquake's impact.



**Figure 1.** Knowledge of Earthquake on Students of State Senior High School 1 Karangreja  
*Source: Research data processing, 2021*

Figure 3, which presents data on students' knowledge about earthquakes in State Senior High School 1 Karangreja, is represented in a diagram. Students with a high knowledge level of 18% in Figure 3 are symbolized in green, and those with moderate knowledge are 66% and symbolized in blue. Meanwhile, the percentage of those who have shared knowledge is 16%. Looking at the data processing results, it is found that the knowledge level of students on earthquakes still needs to be improved. Therefore, schools and teachers, particularly geography teachers, need to improve their efforts in providing education about disasters, especially earthquakes. This is because students are one of the most vulnerable groups affected by disasters. Hopefully, when a volcanic earthquake occurs, students will be prepared and know what actions must be taken.

### 3.2.2 Attitude

**Table 4.** Preparedness Attitude of State Senior High School 1 Karangreja Students in Dealing with Earthquakes

Score Interval	Percentage (%)	Criteria	F	%
76 – 100	76 – 100	Very Good	29	52
12 – 7	51 – 75	Good	27	48
6 – 11	26 – 50	Fair	0	0
0 – 5	0 – 25	Less	0	0
Total			56	100

*Source: Research data processing, 2021*

Preparedness in dealing with disasters is essential; therefore, it is necessary to provide disaster preparedness education and training to students to improve their readiness. Disaster preparedness is

obtained from formal education, such as disaster education and training, and by experiencing a disaster or non-formal education (Bernales et al., 2018; Latupeirisa & Pujianto, 2020). People who have experienced a disaster usually tend to be more prepared when the disaster occurs again than those who have never experienced a disaster (Becker et al., 2017). Based on the data obtained by researchers from questionnaires filled out by the students of State Senior High School 1 Karangreja through Google form, data about the attitudes of students in State Senior High School 1 Karangreja in dealing with the earthquake disaster was obtained. Most students have an excellent attitude (52%) and are willing to accept, respond, appreciate and be responsible. Students had a vigilant attitude when a disaster occurred. Students knew the evacuation route signs at the school and were willing to participate in school activities related to earthquake disaster education. From the response to questionnaires, students show wills to maintain facilities and infrastructures to support earthquake disaster education activities at the school. The Percentage of Attitudes of State Senior High School 1 Karangreja students to make students ready for earthquake disasters can be seen in Table 4.

**Table 5.** Distribution of Preparedness Attitudes of State Senior High School 1 Karangreja Students in Dealing with Disasters

No.	Question Indicators	SA	A	U	D
1	Vigilant attitude to the threat of earthquake disaster	68%	32%	0%	0%
2	The attitude of knowing the earthquake evacuation route at school.	34%	63%	4%	0%
3	Willingness to participate in socialization about earthquake disasters and to share the information obtained.	55%	41%	0%	4%
4	Willingness to attend training if the school holds earthquake preparedness training	53%	44%	2%	0%
5	Willingness to maintain facilities and infrastructure to support earthquake disaster education	48%	50%	2%	0%

Source: Research data processing, 2021

The percentage of preparedness attitudes of questionnaire students presented in Table 3 shows that the pupils have an excellent attitude with a percentage of 52% or 29 respondents. Meanwhile, the percentage of State Senior High School 1 Karangreja students with a good attitude is 48% or 27 respondents. The attitude of student preparedness is varied from good to very good due to the results of education from parents and various parties at the school.

Table 5 shows the attitude of students' preparedness in dealing with earthquake disasters. It shows that 68% of students answered that they strongly agreed, and 32% of respondents answered agreed. The table also shows that the average student is already alert to the threat of an earthquake if

it occurs at any time. The willingness to participate in socialization about the earthquake is as much as 34% or 63 students for those who strongly agreed. Meanwhile, 4% of respondents did not agree to participate in the socialization. The willingness to maintain facilities and infrastructure at the school shows that as much as 48% of students strongly agreed to maintain facilities and infrastructure. Meanwhile, 50% of respondents agreed to maintain facilities and infrastructure at the school, and 1% of respondents did not agree to maintain facilities and infrastructure available at the school.

#### 4. Conclusion

Education about disaster must be implemented in formal and non-formal schools, especially schools in disaster-prone areas such as State Senior High School 1 Karangreja. There is no particular subject for disaster education at State Senior High School 1 Karangreja. Geography teachers in State Senior High School 1 Karangreja have provided education on earthquake disasters through the Role Playing learning model, which is based on the curriculum applied in schools, namely according to Basic Competence curriculum number 3.5 for grade X about Lithosphere where teachers provide knowledge to students about earthquake disasters from the definition and causes of earthquakes to how to mitigate when an earthquake occurs at any time as well as provide knowledge on how to reduce the risk impact of an earthquake. While In grade XI, it is based on Basic Competence number 3.7 about analysis of the types and management of natural disasters through education of local wisdom and the use of modern technology as well as presenting certain disaster management concepts. The level of knowledge of earthquake disaster preparedness among students in State Senior High School 1 Karangreja has an average knowledge of earthquake disasters, which is about 66% of respondents or students.

In comparison, those with insufficient knowledge of earthquake disasters are 16%. Preparedness Attitudes of State Senior High School 1 Karangreja students, on average, have excellent preparedness attitudes with a percentage of 52% or 29 respondents, while 48% of respondents have good earthquake preparedness attitudes. The school needs to organize and provide special education on the disasters regarding earthquakes. Simulations need to be held so that students understand better. Furthermore, all school members, including students, teachers, and other school officials, should work together to maintain the facilities and infrastructure owned by the school.

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