International Summit on Science Technology and Humanity
ISETH 2025
ISSN: 2615-1588 (online)

# Investigating the Link Between Knowledge and Earthquake Preparedness among High School Students

Nanda Eka Rahmawati[1] , Yunus Aris Wibowo[1, 2], Wahyu Widiyatmoko[1, 2]

[1] Faculty of Teacher Training and Education, Universitas Muhammadiyah Surakarta, Surakarta, Indonesia
[2] Center for Disaster Mitigation Study, Universitas Muhammadiyah Surakarta, Surakarta, Indonesia

**Abstract**

*Purpose*: This study aims to determine students' knowledge of earthquake disasters, assess students preparedness in facing earthquake disasters, and analyze the relationship between knowledge and preparedness among students of SMA Negeri 1 Wedi.
*Methodology*: The study was conducted at SMA Negeri 1 Wedi with a population of 745 students. A sample of 260 students was selected using the Slovin formula with a 5% margin of error. Data were collected through tests, questionnaires, and documentation. The sampling technique used was Stratified Random Sampling, and data analysis was performed using the Product Moment correlation test.
*Results*: The results indicate that most students fall into the moderate knowledge category, suggesting that their understanding of earthquake disaster still needs improvement. Students with low knowledge account for 13%, while only 10% demonstrate high knowledge, highlighting the need for more intensive disaster education. In terms of preparedness, students are also predominantly the moderate category, indicating basic but not optimal preparedness. Only 3% of students show high preparedness, while 10% remain at a low level. Correlation analysis show a significant relationship between knowledge and disaster preparedness, with a Sig. (2-tailed) value of 0.000 <0.05, confirming that higher knowledge levels are associated with better preperedness.
*Applications/Originality/Value*: The findings emphasize the importance of strengthening disaster education to improve both students' knowledge and preparedness. Schools are encouraged to integrate earthquake disaster education into the curriculum and conduct regular training and simulations to optimize students' readiness in facing potential disasters
Keywords: Disaster, knowledge, preparedness, earthquake.

## Introduction Section

Indonesia is an archipelagic nation geographically located at the confluence of four tectonic plates: the Eurasian Plate, the Indo-Australian Plate, the Pacific Plate, and the Philippine Plate. This condition makes Indonesia one of the countries with the highest seismicity rates in the world, even more than ten times that of the United States (Bappenas and BKNPB Jakarta, 2016). Law Number 24 of 2007 concerning Disaster Management defines a disaster as an event that disrupts people's lives and causes significant losses in social, economic, and environmental spheres. Earthquakes, among the most dangerous natural disasters, can occur suddenly without explicit warning, increasing community vulnerability (Dien et al., 2015).

The impact of earthquakes is felt not only in the social and economic sectors but also in the education sector. Learning processes can be disrupted, school facilities damaged, and student safety threatened. Therefore, disaster preparedness and mitigation need to be instilled from an early age, particularly through formal educational institutions, from elementary to high school (Kurniawati & Suwito, 2017; Pramesti, 2011). Schools play a strategic role in developing students' knowledge, skills, and disaster response attitudes through curriculum, training, and disaster response practices (Hawina et al., 2016).

Students are a highly vulnerable group to disaster risks, especially those living in areas with high seismicity. Disaster mitigation education in schools can equip students with an understanding of disaster characteristics, prevention methods, preparedness measures, and emergency response actions (Hayudityas, 2020). Schools also serve as centres for disseminating disaster knowledge to the community through interactions between students and their surrounding environment (Indriasari & Kusuma, 2020). The concept of disaster-prepared schools, as outlined in Law Number 24 of 2007, is one strategy for building school resilience in the face of disasters (Zahara, 2019).

Although disaster mitigation education has been widely introduced at various levels of education, its implementation remains uneven, particularly in schools located in disaster-prone areas. Previous studies have focused more on evaluating national policies or general community preparedness. In contrast, in-depth studies of the preparedness levels of high school students in earthquake-prone areas are limited. Furthermore, few studies have examined the effectiveness of disaster mitigation implementation in high schools directly affected by major disasters. This situation indicates a research gap regarding how schools in disaster-prone areas, such as SMA Negeri 1 Wedi, build student preparedness in the face of earthquake threats (Suarmika & Utama, 2017; Humsona et al., 2019).

Klaten Regency is an earthquake-prone area, as evidenced by the May 27, 2006, earthquake, which lasted 57 seconds and measured 5.9 on the Richter scale. This event resulted in the deaths of dozens of teachers and hundreds of students,

and hundreds of school buildings were damaged and collapsed (detikNews, 2006). SMA Negeri 1 Wedi was one of the schools significantly impacted by this incident and remains in a Disaster-Prone Area (KRB). Due to its proximity to tectonic and volcanic activity, the possibility of a similar earthquake occurring again cannot be ruled out. This situation emphasises the urgency of research into the level of knowledge, preparedness, and implementation of disaster mitigation among students at SMA Negeri 1 Wedi, as an effort to reduce future disaster risk.

## Research Method

This research was conducted at SMA Negeri 1 Wedi, Klaten Regency. This study used a quantitative, cross-sectional, positivist method with a correlational research design, following Arikunto (2019). The population in this study was all 260 students of SMA Negeri 1 Wedi. The sampling technique used was stratified random sampling, a sampling technique in which the population with specific characteristics is randomly selected from each stratum.

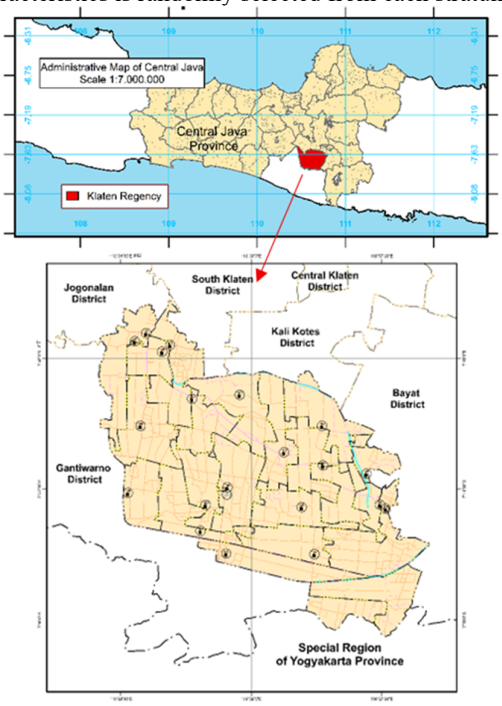


**Figure 1.** Research location

This research was conducted at SMA Negeri 1 Wedi, Klaten Regency, located in an earthquake-prone area. The study population comprised 745 students in grades X, XI, and XII at SMA Negeri 1 Wedi for the 2023/2024 academic year. The sample size in this study was 260, calculated using the 5% Slovin formula. Data collection techniques included questionnaires, documentation, and other methods. The sample was selected using stratified random sampling from students of SMA Negeri 1 Wedi in grades X, XI, and XII. The dependent variable in this study was preparedness, and the independent variable was knowledge. In the questionnaire, the knowledge variable used multiple-choice questions with response options of "yes," "no," and "don't know (Table 1)."

**Table 1.** Indicators and parameters of knowledge variable instruments

| | Indicators | Parameters | Number of questions or statements |
|---|---|---|---|
| Knowledge | Disaster Characteristics | Know the characteristics of earthquake disasters | 10 |
| | Early Warning Systems | Understand the earthquake early warning system | 1 |
| | Evacuation Facilities | Know the earthquake evacuation facilities | 2 |
| | Evacuation Routes | Know earthquake evacuation routes | 6 |

| | | | |
|---|---|---|---|
| | Disaster Experience | Have experience in dealing with disasters | 1 |

Source : Patrisia Reinny, 2018

**Table 2.** Indicators and parameters of preparedness variable instruments

| | Indicators | Parameters | Number of questions or statements |
|---|---|---|---|
| Preparedness | Disaster knowledge | 1. Understand what is meant by a natural disaster.<br>2. Understand the types of disasters that occur after an earthquake.<br>3. Explain the vulnerability of the school environment and physical structures.<br>4. Understand how to anticipate a natural disaster. | 10 |
| | Emergency response plans | 1. There is a school emergency plan.<br>2. There are standard school procedures for disaster emergencies.<br>3. There is a location plan, map, and evacuation route.<br>4. There is a first aid plan.<br>5. There is a rescue plan. School safety and security.<br>6. There is access to essential facilities.<br>7. There is access to disaster preparedness education. | 5 |
| | Disaster warning systems | 1. Access to traditional or local disaster warning information sources.<br>2. Access to earthquake warning system information sources.<br>3. Equipment capable of capturing disaster warning information.<br>4. Procedures for distributing disaster warnings.<br>5. Training and simulations. | 6 |
| | Resource mobility | Students take part in activities/training/meetings related to disaster management and share/tell their knowledge and skills with their surrounding environment. | 2 |

Source: LIPI,2007

The data analysis techniques used in this study were prerequisite analysis and hypothesis testing. The prerequisite analyses in this study included normality and homogeneity tests, while the hypothesis test used the product-moment correlation. The hypotheses in this study are:

H0: There is no significant relationship between the level of knowledge and the preparedness of SMA Negeri 1 Wedi students for earthquake disasters.

H1: There is a significant relationship between the level of knowledge and the preparedness of SMA Negeri 1 Wedi students for earthquake disasters.

## Results and Discussion

### *Result*

#### *Level of knowledge of students of SMA Negeri 1 Wedi regarding earthquake disasters*

Knowledge about disasters is crucial for individuals and communities. The knowledge of disaster-prone communities is a primary focus for disaster stakeholders seeking to improve disaster preparedness. The community, particularly students and the entire school community at Wedi High School, will have a good understanding of potential earthquakes. Knowledge is a key element of preparedness, influencing community attitudes and awareness in anticipating disasters. Knowledge is acquired through repeated experiences, and disaster experiences serve as lessons learned when facing a future disaster (Havwina et al., 2016).

**Table 3.** Students' knowledge of disasters at SMA Negeri 1 Wedi

| | Knowledge Variable | Respondents' answers | |
|---|---|---|---|
| | | Frequency | Percentage (%) |
| 1. | What is meant by natural disaster? | | |
| | a. Correct | 235 | 90,38 |
| | b. Incorrectly | 25 | 9,62 |
| 2. | Definition of earthquakes? | | |
| | a. Correct | 241 | 92,69 |
| | b. Incorrectly | 19 | 7,31 |
| 3. | What are some phenomena that you can identify to indicate an earthquake disaster? | | |
| | a. Correct | 63 | 24,23 |
| | b. Incorrectly | 197 | 75,77 |
| 4. | In your opinion, the causes of earthquakes include? | | |
| | a. Correct | 170 | 65,38 |
| | b. Incorrectly | 90 | 34,62 |
| 5. | Which is not a natural disaster | | |
| | a. Correct | 211 | 81,15 |
| | b. Incorrectly | 49 | 18,85 |
| 6. | What causes earthquakes? | | |
| | a. Correct | 183 | 70,38 |
| | b. Incorrectly | 77 | 29,62 |
| 7. | Statements that are not characteristics of geological natural disasters | | |
| | a. Correct | 157 | 60,38 |
| | b. Incorrectly | 103 | 39,62 |
| 8. | What are the main causes of meteorological natural disasters? | | |
| | a. Correct | 156 | 60,00 |
| | b. Incorrectly | 104 | 40,00 |
| 9. | What is the main cause of earthquakes? | | |
| | a. Correct | 238 | 91,54 |
| | b. Incorrectly | 22 | 8,46 |
| 10. | Which country in the Asia Pacific is considered one of the most vulnerable to natural disasters? | | |
| | a. Correct | 147 | 56,54 |
| | b. Incorrectly | 113 | 43,46 |
| 11. | What is the main function of an earthquake early warning system? | | |
| | a. Correct | 222 | 85,38 |
| | b. Incorrectly | 38 | 14,62 |
| 12. | What efforts are included in preparing for an earthquake disaster? | | |
| | a. Correct | 166 | 63,85 |
| | b. Incorrectly | 94 | 36,15 |
| 13. | Which is not an effort to overcome natural disasters? | | |
| | a. Correct | 140 | 53,85 |
| | b. Incorrectly | 120 | 46,15 |
| 14. | What should you do when an earthquake occurs and you are in a multi-story building? | | |
| | a. Correct | 196 | 72,38 |
| | b. Incorrectly | 64 | 27,62 |
| 15. | What should you do when an earthquake occurs and you are outdoors? | | |
| | a. Correct | 216 | 83,08 |

| | | | |
|---|---|---|---|
| | b. Incorrectly | 44 | 16,92 |
| 16. | What should you do when an earthquake occurs and you are in an elevator? | | |
| | a. Correct | 229 | 88,08 |
| | b. Incorrectly | 31 | 11,92 |
| 17. | What should you do when an earthquake occurs and you are on the ground floor? | | |
| | a. Correct | 206 | 79,23 |
| | b. Incorrectly | 18 | 6,92 |
| 18. | What should you do when an earthquake occurs and while driving? | | |
| | a. Correct | 228 | 87,69 |
| | b. Incorrectly | 32 | 12,31 |
| 19. | What actions should be taken after an earthquake occurs, except? | | |
| | a. Correct | 154 | 59,23 |
| | b. Incorrectly | 106 | 40,77 |
| 20. | Steps to increase awareness of earthquake disasters, except | | |
| | a. Correct | 154 | 59,23 |
| | b. Incorrectly | 106 | 40,77 |

Source : Data analysis, 2025

Based on Table 3, respondents answered question 1 correctly regarding natural disasters as disasters caused by natural events as many as 235 (90.38%), while respondents answered incorrectly as many as 25 (9.62%). Respondents who answered question 2 correctly regarding the definition of earthquakes as shocks or vibrations that occur on the surface of the earth numbered as many as 241 (92.69%), while respondents who answered incorrectly numbered as many as 19 (7.31%). Respondents who answered question 3 correctly regarding the phenomenon known to state earthquake disasters are feeling shocks and seeing objects around them shaking, as many as 63 (24.23%), and respondents who answered incorrectly, as many as 197 (75.77%). Respondents who answered question 5 correctly regarding the causes of earthquakes included tectonic processes due to the movement of the earth's crust/plates, with 170 (65.38%). In comparison, respondents answered incorrectly 90 times (34.62%). Respondents who answered question 5 correctly, regarding the statement that famine and the coronavirus are NOT examples of natural disasters, were 211 (81.15%), while 49 (18.85%) answered incorrectly.

In question 6, 183 (70.38%) respondents correctly answered that earthquakes are caused by the movement of the earth's plates, while 77 (29.62%) answered incorrectly. Respondents who answered question 7 correctly, regarding the statement that hurricanes and floods caused by waste disposal in rivers are NOT characteristics of geological natural disasters, were 157 (60.38%), while 103 (39.62%) answered incorrectly. In question 8, 156 (60.00%) respondents correctly answered that the leading cause of meteorological natural disasters is weather-related phenomena, while 104 (40.00%) answered incorrectly. 238 (91.54%) respondents answered correctly on question 9, stating that the leading cause of earthquakes is tectonic plate movement. 22 (8.46%) respondents answered incorrectly. Regarding question 10, 147 (56.54%) respondents answered correctly that Japan is the most vulnerable country in the Asia Pacific region to natural disasters. 113 (43.46%) respondents answered incorrectly.

Respondents who answered correctly to question 11, which asked about the primary function of the earthquake early warning system, were to inform about the potential for a tsunami and provide early warning to the public (222, 85.38%). In comparison, respondents who answered incorrectly were 38 (14.62%). In question 12, respondents who answered correctly about efforts included in earthquake disaster preparation, with activities carried out before the earthquake disaster to facilitate the use of available natural resources, numbered 166 (63.85%). In comparison, respondents who answered incorrectly numbered 94 (36.15%). Respondents answered question 13 correctly about what is NOT a natural disaster mitigation effort, which is prevention against natural disasters, as many as 140 (53.85%). In comparison, those who answered incorrectly numbered 120 (46.15%). In question 14, respondents answered correctly about the attitude when an earthquake occurs and is in a multi-storey building, which is to remain calm indoors and find a place that is considered safe until the shaking stops, as many as 196 (72.38%), and respondents who answered incorrectly, as many as 64 (27.62%). Respondents correctly answered question 15 regarding behavior during an earthquake and being outdoors, with 216 (83.08%) responding: "Seek an open space and stay away from trees or buildings," while 31 (11.92%) responded incorrectly.

In question 16, the correct response regarding behavior during an earthquake and in an elevator was to remain calm and press the emergency button. 229 (88.08%) responded correctly, while 31 (11.92%) responded incorrectly. Question 17, regarding behavior during an earthquake and being on the ground floor, was to run to the ground floor immediately. 206 (79.23%) responded correctly, while 18 (6.92%) responded incorrectly. In question 18, the correct response regarding behavior during an earthquake while driving was to stop, pull over, move away from trees or tall buildings, and get out of the vehicle. 228 (87.69%) responded incorrectly, while 32 (12.31%) responded correctly. Respondents who answered correctly on number 19 regarding attitudes taken after an earthquake, except building a house without considering earthquake-safe materials, were 154 (59.23%), and respondents who answered incorrectly were 106 (40.77%). Then, respondents who answered correctly to question 20 regarding steps not to increase awareness of the

possibility of an earthquake, the majority (154; 59.23%) prepared family photos, while respondents who answered incorrectly were 106 (40.77%). Figure 3 presents the questionnaire results for the knowledge variable.

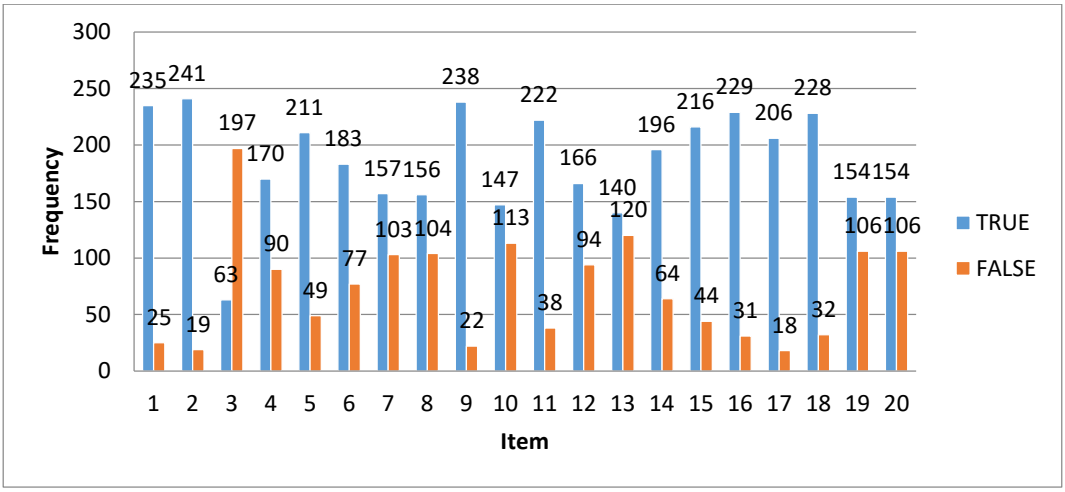


**Figure 2**. Knowledge variables
Source: Data analysis, 2025

For each indicator, data were collected from 260 respondents using a questionnaire. The first variable was obtained in several categories, presented in Table 4.

**Table 4.** Disaster knowledge

| Scale | Criteria | Frequency | Presentase |
|---|---|---|---|
| >17 | High | 27 | 10,38% |
| 11-17 | Medium | 199 | 76,53% |
| <11 | Low | 34 | 13,07% |
| | Total | 260 | 100% |

Source: Data analysis, 2025

Table 4 shows that the majority of students are in the moderate category, indicating that their knowledge of earthquake disasters still needs improvement. Meanwhile, the proportion of students with low knowledge remains quite large (13%), while those with high knowledge remain relatively small (10%). It indicates the need for more intensive disaster education interventions. Disaster knowledge in this first variable consists of five (5) indicators, namely: (1) disaster characteristics, (2) early warning systems, (3) evacuation facilities, (4) evacuation routes, and (5) disaster experience.

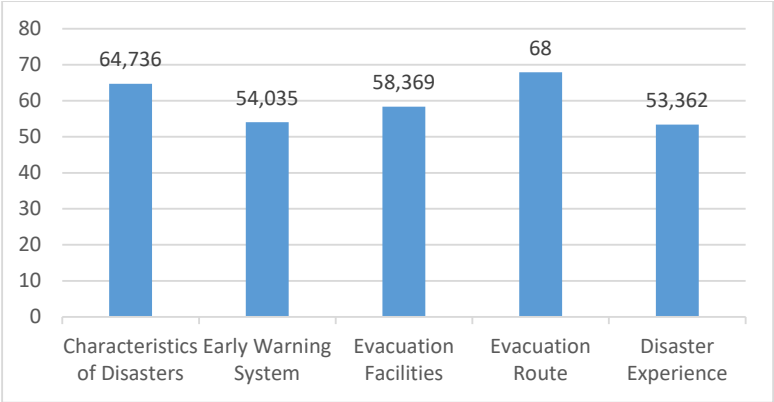


**Figure 3.** Indicators on the knowledge variable
Source: data analysis, 2024

In Figure 3, in indicator 1: disaster characteristics, 211 students (81.15%) are in the medium category, 26 students (10.00%) are in the low category, and 23 students (8.85%) are in the high category. Furthermore, the second indicator is the early warning system: 222 students (85.38%) are in the high category, and 38 students (14.62%) are in the low category.

In indicator 3, Evacuation facilities, 110 students (42.31%) are in the medium category, 52 students (20.00%) in the low category, and 98 students (37.69%) in the high category. In indicator 4, Evacuation routes, 232 students (89.23%) are in the medium category, 28 students (10.77%) are in the low category, and 0 students (0%) are in the high category. In indicator 5, "Experience in Facing Disasters," 106 students (40.77%) were in the high category, meaning they had experience in dealing with disasters. However, 154 students (59.23%) were in the low category, meaning they had no such experience. Of these indicators, the early warning system aspect received the highest score, indicating that most students understand the importance of early warnings and how they work. Conversely, the understanding of evacuation routes was uneven, as indicated by the absence of students in the high category.

### *Preparedness of Students At SMA Negeri 1 Wedi in Facing Earthquake Disasters*

Preparedness is a series of activities carried out to address disasters through organization and appropriate, practical steps (Law of the Republic of Indonesia Number 24 of 2007). Preparedness is an action governments, organizations, families, and individuals can take to respond to a disaster quickly and appropriately, reducing losses or casualties (Carter, 1991, in LIPI - UNESCO/ISDR, 2006). Disaster risk reduction includes disaster management plans, disaster education, early warning systems, evacuation sites, and supplies to meet basic needs (Ningtyas, 2015). The first step in preparedness is providing an early warning to disseminate information immediately, especially to communities threatened by disaster (Anies, 2017). Providing early warning is a sign that a disaster is likely. In providing an early warning, it must be easily accessible and understandable (accessible), immediate (immediate), not confusing (coherent), and official (Paripurno & Jannah, 2018).

**Table 4.** Student preparedness for disasters at SMA Negeri 1 Wedi

| Preparedness Variable | Percentage of respondents' answers (%) | | |
|---|---|---|---|
| | True | False | Don't Know |
| **Knowledge about disasters** | | | |
| A natural disaster is a natural event that disrupts human life. | 89,23 | 6,92 | 3,85 |
| The natural event that causes a disaster is an earthquake. | 96,15 | 1,92 | 1,92 |
| The cause of an earthquake is a shift in the earth's crust. | 93,08 | 3,85 | 3,08 |
| The natural disaster following an earthquake is a tsunami. | 86,15 | 8,46 | 4,38 |
| The time and location of an earthquake can be predicted. | 22,69 | 64,23 | 13,08 |
| Signs of a strong earthquake are cracked or collapsed buildings. | 90,77 | 4,62 | 4,62 |
| When an earthquake occurs at school, people run to the field. | 94,23 | 2,31 | 3,46 |
| Every earthquake will cause a tsunami. | 27,31 | 56,54 | 16,15 |
| A tsunami occurred in Aceh and Nias on December 26, 2004. | 36,92 | 47,69 | 15,38 |
| The cause of a tsunami is an underwater earthquake. | 88,08 | 3,08 | 8,85 |
| A sign of a tsunami is a sudden receding of the sea. | 83,85 | 10,77 | 5,38 |
| When the sea suddenly recedes, immediately move away from the sea. | 89,23 | 6,92 | 3,85 |
| Earthquake preparedness by increasing knowledge about earthquakes. | 93,08 | 4,23 | 2,69 |
| Knowledge about disasters can be obtained by listening to information about earthquakes and tsunamis on the radio, TV, and other media. | 93,85 | 4,2 | 1,92 |
| Schools provide lessons on earthquake disasters. | 88,08 | 8,85 | 3,08 |
| Learn about first aid during disasters. | 84,62 | 10,77 | 4,62 |
| Have you ever discussed earthquakes with friends or family? | 88,85 | 6,92 | 4,23 |
| **Disaster activity plan** | | | |
| Preparing for an earthquake by knowing safe places | 91,69 | 4,23 | 3,85 |
| The only person who needs to be saved during an earthquake is yourself | 91,54 | 6,92 | 1,54 |
| At school, students can learn about disasters from earthquake books | 61,92 | 28,85 | 9,23 |
| At school, there are first aid kits and essential medications to support disaster preparedness | 90,77 | 5,77 | 3,46 |
| At school, there are disaster preparedness groups | 51,92 | 23,85 | 24,23 |
| **Disaster early warning system** | | | |
| Be aware of earthquake warnings in the surrounding area, including traditional signs/local conventions (gongs, bells, etc.). | 82,69 | 10,00 | 7,31 |
| When you hear a danger signal, immediately head to an evacuation center. | 91,15 | 5,77 | 3,08 |
| Be aware of the signs that the situation is safe after an earthquake. | 66,92 | 14,62 | 18,46 |

| | | | |
|---|---|---|---|
| Be aware of the tools, signs, or sounds used for earthquake warnings at school. | 67,31 | 14,62 | 18,08 |
| Be aware of the differences between warning signs/sounds, cancellations, and safe conditions. | 59,62 | 13,85 | 26,54 |
| Have participated in disaster warning activities/drills/simulations. | 64,62 | 26,92 | 8,46 |
| **Resource mobility** | | | |
| Have you ever participated in scouting activities/training/simulations (roping, setting up tents, and making stretchers)? | 88.85 | 7,31 | 3,85 |
| Have you ever shared/told your friends/family/neighbors about this knowledge and skills? | 71,92 | 20,00 | 8,08 |

Source: Data analysis, 2025

**Table 4.** Student preparedness in facing disasters

| Scale | Criteria | Frequensi | Presentase |
|---|---|---|---|
| >83 | High | 8 | 3,07 |
| 55-83 | Medium | 225 | 86,53 |
| <55 | Low | 27 | 10,38 |
| | Total | 260 | 100% |

Source: Data analysis, 2025

Table 4 shows that the majority of students are in the moderate category, indicating basic preparedness but not optimal. Only 3% showed high preparedness, while 10% were still low. These results suggest that students at SMA Negeri 1 Wedi are prepared to face disasters but need further optimization. Disaster preparedness in the second variable can be determined using a questionnaire containing several questions. The questions in this second variable consist of four (4) indicators as follows: (1) knowledge about disasters, (2) emergency response plans, (3) disaster warning systems, and (4) resource mobility.

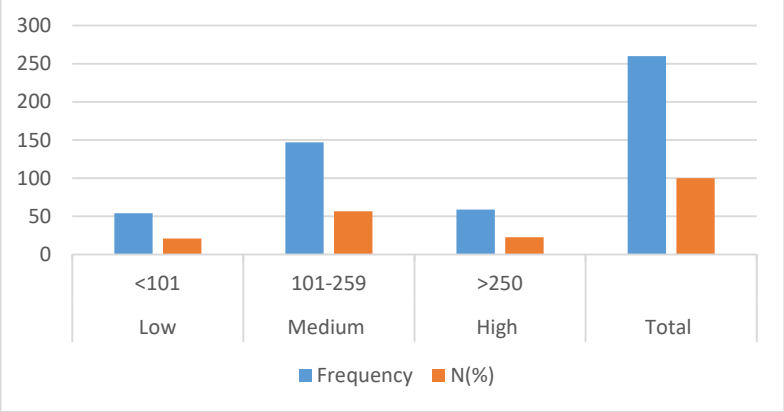


**Figure 4**. Knowledge about disasters
Source: Data analysis, 2025

Figure 4 shows the knowledge indicator for disasters: 147 students (56.54%) were in the medium category, 59 students (22.69%) in the high category, and 54 students (20.77%) in the low category.

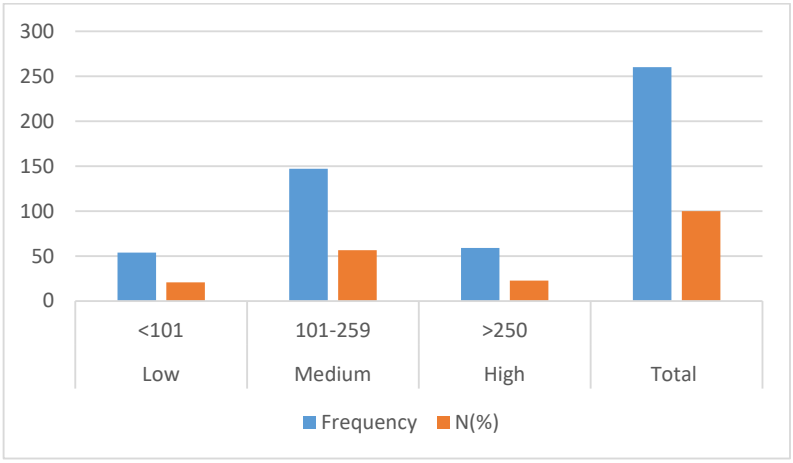


**Figure 5**. Emergency Response Plan
Source: Data analysis, 2025

In Figure 5, the emergency response plan indicators obtained were 185 students (71.15%) in the medium category, 46 students (17.69%) in the high category, and 29 students (11.15%) in the low category.

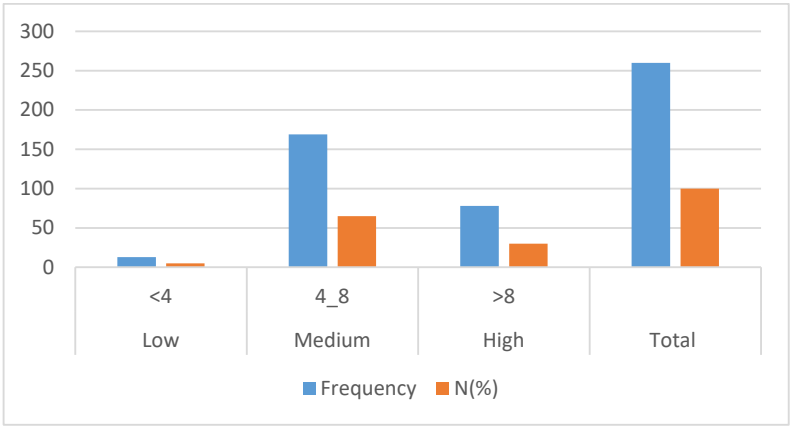


**Figure 6**. Disaster Warning System
Source: Data analysis, 2025

In Figure 6, the Disaster Warning System indicator shows that 169 students (65.00%) are in the medium category, 78 students (30.00%) are in the high category, and 13 students (5.00%) are in the low category.

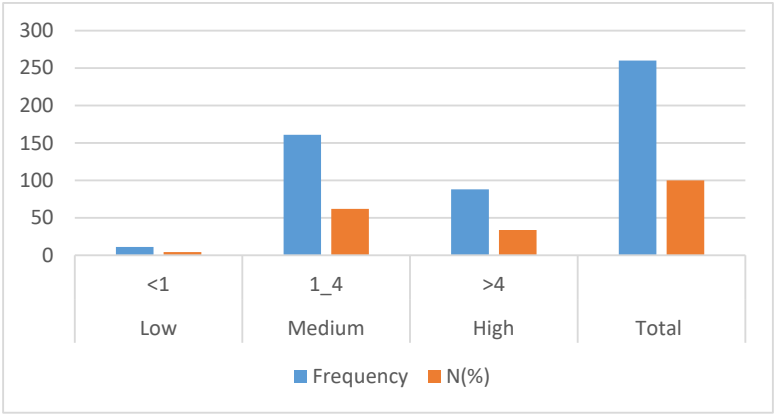


**Figure 7**. Resource Mobilization
Source: Data analysis, 2025

Based on Figure 7, the Resource Mobilization indicator shows that 161 students (61.92%) are in the medium category, 88 students (33.85%) are in the high category, and 11 students (4.23%) are in the low category. The emergency response plan indicator shows a relatively good level of preparedness, with 71% of students understanding emergency response steps. However, low levels of preparedness remain across all indicators, underscoring the need for regular training and simulations.

### *The relationship between knowledge and preparedness of students of SMA Negeri 1 Wedi in facing earthquake disasters*

In this study, the researchers used the Pearson Product-Moment correlation (r). The correlation test is used to assess the strength of the relationship between the independent and dependent variables. In hypothesis testing, if the correlation coefficient is significant, it can be used to calculate the coefficient of determination, which measures the influence of the independent variable on the dependent variable (Table 5).

**Table 5.** Correlation test results

| | | Knowledge | Preparedness |
|---|---|---|---|
| Knowledge | Pearson Correlation | 1 | .256** |
| | Sig. (2-tailed) | | .000 |
| | N | 260 | 260 |
| Preparedness | Pearson Correlation | .256** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 260 | 260 |

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Data analysis, 2025

The analysis of the relationship between knowledge and disaster preparedness yielded a Sig. (2-tailed) value of 0.000 <0.05, thus accepting the hypothesis that there is a significant relationship between the level of knowledge and the preparedness of SMA Negeri 1 Wedi students in facing earthquakes. The relationship between knowledge and preparedness shows a positive, low pattern, meaning that as knowledge increases, preparedness behavior increases.

The knowledge of communities living in disaster-prone areas is the primary concern for disaster stakeholders to improve disaster preparedness. It is hoped that the community, especially students and the entire school community at SMA Wedi, can continue to improve their knowledge of impending earthquakes and develop an understanding and awareness of them. The results of this study align with Dewi Candra et al. (2022), who found that knowledge and preparedness for disasters are related. Therefore, continuous disaster education must be provided to students of SMP Negeri 1 Kemalang in educational institutions so that they know what to do when a disaster occurs. Then, research conducted by Al Banna, F. H., & Dewi, R. P. (2025) showed that preparedness to face disasters was 97%, indicating that students were ready.

Furthermore, the hypothesis test carried out obtained a Sig. Value of 0.00 <0.05 meaning that there was a significant influence between knowledge and students' readiness to face earthquake disasters., and research conducted by Sari & Panzilion (2022) also obtained results that there was a relationship between the level of knowledge about disasters and the level of disaster preparedness in eighth semester nursing students at Muhammadiyah University of Bengkulu, with a p-value = 0.005 α <0.05 meaning significant. In addition, Asiah et al. (2023) observed that students with higher levels of knowledge showed better preparedness attitudes. Additional support is provided by Yayla and Şahinöz (2020) in their meta-analysis, which concluded that there is a strong relationship between knowledge and preparedness regarding personal safety protocols.

## *Discussion*

1. Level of student knowledge about earthquake disasters

   The results of this study demonstrate students' understanding and awareness of natural disasters, particularly earthquakes. The questionnaire used in this study asked students about their knowledge of the causes, characteristics, and earthquake preparedness measures. The main findings indicate that most respondents had a good understanding of earthquakes, their causes, and appropriate actions during an earthquake. However, the survey also revealed several knowledge gaps, including misunderstandings about the causes of earthquakes and the appropriate response when in a high-rise building or a vehicle during an earthquake.

   Most respondents correctly identified earthquakes as natural disasters caused by tectonic plate movement. Respondents demonstrated good knowledge of earthquake characteristics, such as ground shaking and the potential for tsunamis. The majority of respondents knew the appropriate actions to take during an earthquake, such as seeking safe shelter and avoiding panic.

However, some respondents had misconceptions about the causes of earthquakes, such as believing that earthquakes are caused by nuclear explosions or volcanic activity. There were also knowledge gaps regarding appropriate responses in certain situations, such as being in a high-rise building or a vehicle during an earthquake. The questionnaire results highlight the need for public education and ongoing awareness campaigns to improve understanding and preparedness for earthquakes and other natural disasters.

The results indicate a strong awareness and understanding of natural disasters among students, particularly earthquakes. There is a clear trend towards preparedness and knowledge acquisition, with educational institutions playing a key role in disseminating information. However, there is still room for improvement in understanding the causes and consequences of these disasters, as well as increasing community involvement in preparedness activities.

Previous studies reinforce the importance of innovative approaches in disaster education. Lovreglio et al. (2018) demonstrated that virtual reality (VR)-based training can improve students' understanding of self-protection measures during earthquakes. Width Yusuf et al. (2021) also found a significant increase from pre-test to posttest in junior high school students in Padang after being exposed to earthquake and tsunami simulations and materials. A similar study by Leo et al. (2021) at the Indonesian University of Education recorded a more than 70% increase in knowledge scores after providing earthquake preparedness materials. Meanwhile, Asiah et al. (2023) reported that the use of role-playing learning models at Karangreja High School resulted in moderate to high levels of student understanding and improved preparedness attitudes. Furthermore, among university students, Bayraktar et al. (2024) reported a moderate positive correlation between earthquake knowledge and awareness of the importance of long-term preparedness.

Furthermore, based on the frequency distribution results, the level of knowledge of students at SMA Negeri 1 Wedi, Klaten Regency, regarding earthquakes was dominated by the moderate category (199 students (76.54%), followed by the low category (34 students (13.08%), and the high category (27 students (10.38%). These results indicate that most students have a sufficient understanding of earthquakes, though some groups still have low levels of knowledge. It is an important indication that socialisation or education regarding earthquakes still needs to be improved comprehensively. Disaster Characteristics: The majority of students (81.15%) fell into the moderate category. Only 8.85% fell into the high category, indicating that a detailed understanding of earthquakes' nature and characteristics remains limited. Early Warning System: Most students (85.38%) already know about an early warning system. It is a positive aspect of early preparedness. Evacuation Facilities: Students' knowledge is quite varied, with 42.31% in the medium category, 37.69% in the high category, and 20% in the low category. Evacuation Routes: Almost all students (89.23%) know the evacuation routes in the medium category, but none have high knowledge. Experience Facing Disasters: Only 40.77% of students have had such an experience. It is understandable considering that not all students possess experience.

2. Preparedness of students in facing earthquake disasters

The study's results were obtained from a survey assessing awareness, understanding, and preparedness for responding to natural disasters. Regarding understanding natural disasters, a significant majority (89.23%) of respondents correctly identified natural disasters as events that disrupt human life. Awareness of the causes of specific natural disasters, such as earthquakes, was relatively high, with 93.08% recognising tectonic plate shifts as the cause. Regarding recognition of disaster types, respondents demonstrated strong knowledge of the types of disasters that can occur after an earthquake, with 86.15% identifying tsunamis and 85.00% recognising landslides as potential consequences. Regarding preparedness measures, a high percentage of respondents (91.92%) indicated the importance of self-rescue training and knowing safe locations before an earthquake occurs. Most respondents (94.23%) would seek safety by moving to an open area during an earthquake.

Regarding awareness of tsunami indicators, a majority of respondents (80.38%) recognised a strong earthquake as a warning sign of a potential tsunami, and 83.85% noted that a sudden receding sea level is an important indicator. Regarding knowledge sources, schools and media (both print and electronic) are the primary sources of information about disasters, with 89.62% and 91.15% of respondents citing them, respectively. Regarding emergency preparedness, the survey revealed that 76.92% of respondents were aware of evacuation routes and emergency supplies available at school, indicating a high level of preparedness for disaster situations. Regarding student involvement, 88.85% of respondents participated in disaster response training or simulations.

Furthermore, the frequency distribution data shows that the majority of students' preparedness levels were in the moderate category (225 students (86.54%), with 27 students (10.38%) in the low category and only eight students (3.08%) in the high category. These findings indicate that although most students are adequately prepared, optimal preparedness remains lacking for many. Disaster Knowledge: 56.54% of students were in the moderate category, and 22.69% were in the high category. It reflects some students' cognitive readiness. Emergency Response Plan: Most students (71.15%) were in the moderate category, with 17.69% in the high category. Disaster Warning System: The majority were in the moderate category (65%), and 30% were in the high category. Resource Mobilisation: 33.85% of students demonstrated high levels of resource mobilisation, while 61.92% remained in the moderate category.

Several studies have shown that educational interventions can significantly improve student preparedness. Widdyusuf et al. (2021) demonstrated that earthquake and tsunami simulation practices at the junior high school level can improve student preparedness for evacuation and safety measures. Furthermore, Leo Widdyusuf et al. (2021) found that earthquake preparedness learning materials significantly improved students' knowledge and preparedness scores

for disasters. Data from Padang (2025) showed that realistic disaster simulations improved students' attitudes and actions during evacuation ($p<0.05$) (Yulfiwanti et al., 2025). Furthermore, Feng et al. (2019) revealed that participants in immersive VR-based training were able to understand evacuation procedures more effectively. Research by Kinanthi et al. (2023) also stated that self-efficacy and knowledge predicted preparedness behaviour (β sign) by up to 62.8%.

3. The relationship between students' knowledge and preparedness in facing earthquake disasters

The analysis of the relationship between knowledge and disaster preparedness yielded a Sig. (2-tailed) value of 0.000 <0.05, thus accepting the hypothesis that there is a significant relationship between the level of knowledge and the preparedness of SMA Negeri 1 Wedi students in facing earthquakes. The relationship between knowledge and preparedness shows a positive, low pattern, meaning that as knowledge increases, preparedness behaviour increases.

The knowledge of communities living in disaster-prone areas is the primary concern for disaster stakeholders to improve disaster preparedness. It is hoped that the community, especially students and the entire school community at SMA Wedi, can continue to improve their knowledge of impending earthquakes and develop an understanding and awareness of them.

The results of this study align with research by Anwar & Mahara (2020), which found a p-value of 0.000 for the relationship between knowledge and preparedness for earthquakes. It shows that there is a relationship between knowledge and students' preparedness at SMA N 9 Takengon towards the earthquake disaster in Ketol District, Central Aceh Regency, in 2017. Then, research conducted by Huriani et al. (2021) also obtained a significant relationship between knowledge and preparedness ($p = 0.001$). Research conducted by Sari & Panzilion (2022) also found a relationship between knowledge of disasters and disaster preparedness among eighth-semester nursing students at Muhammadiyah University of Bengkulu, with a p-value of 0.005 and $\alpha < 0.05$, indicating significance. In addition, Asiah et al. (2023) observed that students with higher levels of knowledge showed better preparedness attitudes. Additional support is provided by Yayla and Şahinöz (2020) in their meta-analysis, which concluded that there is a strong relationship between knowledge and preparedness regarding personal safety protocols.

## Conclusion

This study successfully demonstrated that students at SMA Negeri 1 Wedi, Klaten Regency, generally have a moderate to high level of knowledge about earthquakes, especially in understanding the causes (tectonic plate shifts), the characteristics of shocks, and the consequences, such as tsunamis and landslides. However, there are still gaps in detailed understanding, including some misunderstandings about the causes of earthquakes (nuclear explosions, volcanic eruptions) and the use of early warning systems. The level of preparedness is moderate, demonstrated through evacuation drills, the use of safe routes, and awareness of tsunami indicators. Schools play a significant role in disseminating knowledge and forming a culture of preparedness. However, only a small proportion of students are very well prepared, indicating that there is still room for improvement through practice-based education and simulations. The results of the study indicate that there is a significant relationship between the level of knowledge and the preparedness of SMA Negeri 1 Wedi students in facing earthquake disasters, as indicated by the sig value (2-tailed) of 0.00 < 0.5.

## References


Al Banna, F. H., & Dewi, R. P. (2025). Pengaruh pengetahuan terhadap kesiapan siswa dalam menghadapi bencana gempa bumi di SMA Negeri 1 Wedi Kabupaten Klaten. *Jurnal Pendidikan Geografi Undiksha*, 13(1), 97–109.

Anies. (2017). *Negara Sejuta Bencana. Cetakan-I*. Ar-Ruzz Media.

Arikunto, S. (2019). *Prosedur Penelitian Suatu Pendekatan Praktek*. Rineka Cipta.

Asiah, S., Supriyanti, T. S. A., & Setyowati, D. L. (2023). Earthquake Disaster Education to Students of Senior High School Using Role Playing Learning Model. International Journal of Social Learning, 3(2), 173-187.

Bappenas dengan BKNPB Jakarta. (2016). *Rencana Aksi Nasional Pengurangan Risiko Bencana 2006-2016*. Badan Perencanaan Pembangunan Nasional Press.

Ciptosari, D. C., Ningrum, S. M., Kanapi, B. I. Y., Andreanto, A., Ningsih, E. R., Yuliani, A. D. P. A., & Wardhani, P. I. (2022). Pengetahuan dan kesiapsiagaan siswa terkait bencana erupsi Merapi di SMPN 1 Kemalang. *Jurnal Sosiologi USK: Media Pemikiran & Aplikasi*, 16(1), 65–75.

detikNews. (2006, June 10). *55 & 256 Siswa Tewas Akibat Gempa di Klaten*. Https://News.Detik.Com/Berita/d-613400/55-Guru-256-Siswa-Tewas-Akibat-Gempa-Di-Klaten.

Dien, R., Kumaat, L., & Malara, R. (2015). Pengaruh Penyuluhan Kesehatan Terhadap Kesiapsiagaan Menghadapi Bencana Gempa Bumi Pada Siswa Smp Kristen Kakaskasen Kota Tomohon. *Jurnal Keperawatan*, *3*(2), 1–7.

Hawina, T., Maryani, E., & Nandi. (2016). Pengaruh Pengalaman Bencana Terhadap Kesiapsiagaan Peserta Didik Dalam Menghadapi Ancaman Gempabumi Dan Sma Negeri Siaga Bencana Kota Banda Aceh). *Jurnal Pendidikan Geograf*, *16*(2), 124–131.

Hayudityas, B. (2020). Pentingnya Penerapan Pendidikan Mitigasi Bencana Di Sekolah Untuk Mengetahui Kesiapsiagaan Peserta Didik. *Jurnal Edukasi Non Formal*, *1*(2), 94–102.

Humsona, R., Yuliani, S., & Pranawa, S. (2019). Kesiapsiagaan Anak dalam Menghadapi Bencana: Studi di Kabupaten Sleman. *ALENTA Conference Series*, *2*(3), 259–266.

Indriasari, Fi., & Kusuma, P. (2020). Peran Komunitas Sekolah Terhadap Pengurangan Risiko Bencana Di Yogyakarta. *Jurnal Perawat Indonesia*, *4*(2), 395–401.

Kurniawati, D., & Suwito, ). (2017). Pengaruh Pengetahuan Kebencanaan Terhadap Sikap Kesiapsiagaan Dalam Menghadapi Bencana Pada Mahasiswa Program Studi Pendidikan Geografi Universitas Kanjuruhan Malang. *JPIG (Jurnal Pendidikan Dan Ilmu Geografi)*, *2*(2), 135–142.

LIPI – UNESCO/ISDR. (2006). *Kajian Kesiapsiagaan Masyarakat Dalam Mengantisipasi Bencana Gempa Bumi dan Tsunami*.

Ningtyas, B. (2015). *Pengaruh Pengetahuan Kebencanaan Terhadap Sikap Kesiapsiagaan Warga Dalam Mengahadapi Bencana Tanah Longsordi Desa Sridadi Kecamatan Sirampong Kabupaten Brebes Tahun 2014*. Universitas Negeri Semarang.

Paripurno, E., & Jannah, M. (2018). *Panduan Pengelolaan Risiko Bencana BerbasisKomunitas (PRBBK) (2 ed.)*. Deepublish.

Pramesti, C. (2011). Kesiapsiagaan Masyarakat di Kawasan Teluk Pelabuhan Ratu terhadap Bencana Gempa Bumi dan Tsunami. *Jurnal Perencanaan Wilayah Dan Kota*, *22*(22), 1–8.

Sari, A., & Panzilion. (2022). Hubungan Tingkat Pengetahuan Tentang Bencana Terhadap Tingkat Kesiapsiagaan Bencana Pada Mahasiswa Keperawatan Semester VIII di Universitas Muhammadiyah Bengkulu. *Jurnal Ners Generation*, *1*(1), 8–15.

Suarmika, P., & Utama, E. (2017). Pendidikan Mitigasi Bencana Di Sekolah Dasar (Sebuah Kajian Analisis Etnopedagogi). *Jurnal Pendidikan Dasar Indonesia*, *2*(2), 18–24.

Undang-Undang Republik Indonesia Nomor 24 Tahun 2007. (2007). *Undang-Undang Republik Indonesia Nomor 24 Tahun 2007 tentang Penanggulangan Bencana Bidang Kesehatan*.

Yayla, U., Şahinöz, T. (2020). Preparedness for Earthquake: Knowledge and Behavior. Journal of International Health Sciences and Management, 6(11): 46-59.

Zahara, S. (2019). Peran Sekolah Dalam Pendidikan Migitasi Bencana Di Sekolah Menengah Atas. *Jurnal Pencerahan*, *13*(2), 144–155.