



The Impact of Lahar Disasters on Students' Self-Awareness at MTsN 7 Tanah Datar, Tanah Datar Regency

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Abstract: Lahar floods are among the most destructive secondary volcanic hazards and often cause severe disruption to communities and schools in affected areas. This study aimed to analyze students' experiences of lahar disasters, their level of self-awareness, and the relationship between both variables. The research was conducted at MTsN 7 Tanah Datar, one of the schools directly affected by the 2023 Mount Marapi lahar flood, using a quantitative correlational method. Data were collected from 150 students through a structured questionnaire covering indicators of direct experience, knowledge of lahar characteristics, preparedness, emotional awareness, accurate self-assessment, and self-confidence. The results showed that students' disaster experiences were generally high, especially in direct experience (70%) and knowledge of lahar characteristics (85%), while preparedness remained moderate (60%). Students' self-awareness was also mostly in the moderate category across emotional awareness, self-assessment, and self-confidence. Pearson correlation analysis indicated a positive and significant relationship between lahar disaster experience and students' self-awareness, although the correlation strength was low. These findings demonstrate that direct exposure to lahar events plays a role in shaping students' self-awareness; however, their practical preparedness and confidence still require strengthening. Therefore, the study concludes that enhanced disaster education—particularly through simulations and practice-based learning—is essential to improve students' self-awareness and readiness in facing lahar floods.

Keywords: Correlation analysis; Disaster education; Disaster experience; Lahar flood; Student self-awareness

Introduction

Natural disasters are natural events that have a major impact on humans (Hardiyanto et al., 2019). Some natural disasters that occur include geological disasters and hydrometeorological disasters. Hydrometeorological disasters are disasters that occur due to the loss of water balance on earth due to damage to the hydrological cycle dam system, thus affecting the stability of climate conditions and water reserves on the earth's surface (Rosyida et al., 2018). Hydrometeorological disasters often occur, in 2018

reaching 96.8% of the remainder were geological disasters (Yuliani et al., 2024). This type of disaster is influenced by atmospheric dynamics, which include the formation of convective clouds, wind patterns, and the presence of convergence zones that can increase the intensity of extreme rainfall (Tjasyono et al., 2008). In addition, atmospheric instability, increased air humidity, and changes in air masses also heighten the potential for hydrometeorological phenomena such as strong winds, floods, and landslides (Amri et al., 2024). Imbalances in the hydrological cycle through disrupted processes of evaporation, condensation, and infiltration also play an important role in triggering

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hydrometeorological disasters, as changes in these processes directly affect surface runoff and water availability (Windari et al., 2024). From a climatological perspective, climate variability such as sea surface temperature anomalies and changes in regional weather patterns can create extreme conditions that intensify hydrometeorological disasters (Sabrina et al., 2021). Furthermore, disturbed atmospheric stability becomes a triggering factor for extreme rainfall – according to Nurcahyaningtyas et al. (2024), unstable atmospheric conditions (labile) with convective cloud growth are closely related to rainfall intensity in flash flood disasters.

Tectonic plate subduction such as that occurring in the Indo-Australian and Eurasian zones triggers the accumulation of seismic stress and magma at certain depths, thereby increasing the potential for volcanic eruptions and major earthquakes (Alif et al., 2021). Meanwhile, geological disasters are natural disasters that occur as a result of energy within the Earth. The threat of geological disasters includes volcanic eruptions, earthquakes, tsunamis, and landslides (Rais, 2021). This geological disaster is one of the factors that cause Indonesia to be located in the subduction zone of three world tectonic plates, namely the Indo-Australian Plate, the Eurasian Plate, and the Pacific Plate (Yugyasmono et al., 2021). The Eurasian continental plate, which stretches from the west coast of Sumatra to the south coast of Java, continuing east to the Nusa Tenggara region (Nur, 2010), is collided by the Indo-Australian plate and submerged beneath the Eurasian plate, so that the subduction of the plate results in an earthquake path and a series of active volcanoes (Suryaningsih et al., 2017).

One of the active volcanoes is Mount Marapi, West Sumatra. Mount Marapi is a type of Type B volcano. Stratovolcano. Mount Marapi is located at 0°22'47.72" South Latitude and 100°28'16.71" East Longitude with an altitude of 2,891 meters above sea level. Mount Marapi poses a serious threat to two nearby districts, namely Agam Regency and Tanah Datar Regency. Based on 2022 BPS data, 505,181 residents lived in the area. Mount Marapi's volcanic activity on December 3, 2023, produced an ash column height of approximately 5,891 meters above sea level or approximately 3,000 meters above the mountain peak (Mahli et al., 2024).

Tanah Datar Regency has a high level of vulnerability to disasters, because it is influenced by the geographical location of Tanah Datar Regency, some of which are located to the south and some to the east of Mount Marapi (Utami et al., 2024). As a result, Tanah Datar Regency faces various potential eruption-related disasters, including lahars and pyroclastic flows. (Wimbardana et al., 2013). Tanah Datar Regency is one

of the areas prone to lahars following the eruption of Mount Marapi.

Volcanic material in the form of rocks, gravel, and sand will be pushed by runoff with its slope towards the river, so that with high intensity it can cause lahars (Aisy et al., 2024). The cold lahar event on May 11, 2024, caused extensive damage in Tanah Datar and Agam Regencies. The Regional Disaster Management Agency reported more than 61 fatalities and damage to homes, public facilities, and schools (Hakim et al., 2024). Schools affected by the lava flooding require special attention for disaster management, as students are among the groups most vulnerable to natural disasters (Hermon et al., 2019).

One of the disasters caused by the cold lava flood in Pariangan District was the loss of bridges, houses, and several school buildings. One of the affected schools was MTS Negeri 7 Tanah Datar, located near a river that originates from Mount Marapi. This situation provides students with direct experience in dealing with disasters, including participating in evacuations, witnessing environmental damage, and adapting to disruptions to school activities (Yuliani et al., 2024). Disaster self-awareness comprises three main components: Emotional Self-Awareness, Accurate Self-Awareness, Self-Confidence (Sapuntala et al., 2025). Community preparedness, including student groups, is a main component in reducing disaster risk because it is closely related to the ability to understand threats and provide rapid response during emergency situations (Widjanarko et al., 2018). Emergency simulation training can strengthen preparedness through the enhancement of response skills, understanding of evacuation procedures, and speed in decision-making during disaster situations (Nurmansyah et al., 2019).

Previous research has shown that student awareness and preparedness for disasters are influenced not only by formal knowledge, but also by experience and self-reflection skills. For example, a study by Sapuntala et al. (2025) explained that disaster self-awareness consists of the ability to recognize emotions, accurately assess personal abilities, and maintain confidence when facing emergency situations, and these three aspects play an essential role in shaping student preparedness. Similar findings were reported by (Kassim et al., 2025), who found that disaster-related knowledge and experience can enhance students' ability to understand risks and make appropriate decisions when a disaster occurs. In addition, Patel et al. (2023) emphasized that the level of student awareness and preparedness increases when they gain an understanding of potential hazards in their surroundings through real experiences or preparedness drills. Meanwhile, evidence from disaster risk reduction education programs in the Merapi region indicates that

integrating disaster education into the school curriculum can strengthen student understanding and build more resilient preparedness attitudes (Tyas et al., 2020). However, research by Rofiah et al. (2021) showed that improvements in preparedness do not always occur uniformly, especially among students with special educational needs or those in school environments that do not adequately support disaster learning.

Based on these conditions, research on The impact of cold lava flood experiences on students' self-awareness at MTsN 7 Tanah Datar. This study aims to (1) analyze students' experiences of cold lava floods, (2) students' self-awareness of lava flood disasters, (3) the influence of students' experiences on students' self-awareness of lava floods.

Method

This study uses a quantitative approach using numerical data to answer research questions, test hypotheses, and find patterns or relationships between variables (Effendi et al., 2018). The research design used in this study is a correlational study that aims to determine whether there is a relationship and how strong the relationship is between variables without manipulating or directly treating the variables. The study was conducted at MTs Negeri 7 Tanah Datar, Tanah Datar Regency, West Sumatra, which is one of the schools affected by the Mount Marapi lava flood. The study was conducted during the even semester of the 2024/2025 academic year.

A population is all subjects or objects being studied. The population in this study was all students in grades VII, VIII, and IX at MTsN 7 Tanah Datar. Hibberts et al. (2012) stated that a sample is a group of elements selected from a larger group with the hope that studying the smaller group will reveal important information about the larger group (Firmansyah et al., 2022). The sample was determined using the Slovin formula, with the results of the sample calculation then divided proportionally among each group. Each class uses a stratified random sampling technique, because the research population is not at the same level (Chudasama, 2023).

The data collection techniques used in this study were observation, to see the condition of the school and the surrounding environment affected by the disaster, documentation, and using instruments with survey data collection instruments in the form of questionnaires designed to obtain responses from the sample, the instruments were designed to reflect the basic objectives of the study (Hayati et al., 2024). Questionnaires are a data collection technique by distributing questions to respondents to be filled in (Wijayanto, 2025). The questionnaires were distributed to MTS students.

The population in this study consisted of all students of MTsN 7 Tanah Datar in grades VII, VIII, and IX, totaling 150 students. Due to the relatively small population, a total sampling technique was applied, in which all students were included as research respondents. State Islamic Junior High School 7 Tanah Datar (SMK), located near a lava-prone area, was conducted to gather information for analyzing the impact of lava disaster experiences on students' self-awareness at State Islamic Junior High School 7 Tanah Datar.

The instrument used was a questionnaire with a Guttman scale, where each question had two answer choices, namely yes and no. Before testing the data, the instrument prerequisite test was carried out first by calculating its validity and reliability (Muflih, 2015). The calculation of the validity of the instrument used the Pearson product moment correlation formula and the reliability test used Cronbach alpha of 0.715, so $0.715 > 0.60$ which means the questionnaire is reliable. The data analysis technique used a correlation test (Angraini et al., 2022). The correlation test used was the Pearson product moment. The Pearson correlation test aims to determine the magnitude of the significant relationship between variable X and variable Y. Before the correlation test, the first stage was a prerequisite test using normality and homogeneity tests (Susilawati et al., 2025).

The variables used in this study consist of two types. The first variable is the experience of cold lava floods (X), which is represented through three indicators, namely direct experience, knowledge of the characteristics of cold lava floods, and knowledge related to preparedness measures. The second variable is student self-awareness (Y), which is measured through three indicators, namely emotional awareness, the ability to conduct accurate self-assessment, and self-confidence.

Research Instruments

The instrument used was a questionnaire with a Guttman scale, where each question had two answer choices, namely *of* (score 1) and *no* (score 0). The number of questions for the experience variable was 12 items and the self-awareness variable was 12 items. Validity testing was conducted using Pearson product-moment correlation to examine the correlation between item scores and the total score. Reliability testing was conducted using Cronbach's Alpha, where the instrument is declared reliable if the α value is > 0.60 .

Data Collection Techniques

Data collection is done through: Observation, to assess the condition of schools and the surrounding environment affected by the disaster. Stributing

questionnaires to a predetermined sample of students. Documentation, in the form of school records, reports from the Tanah Datar Regency BPBD, and photos of field conditions.

Data Analysis Techniques

Data analysis includes two stages, namely: Descriptive analysis, used to describe the tendencies of respondents' answers in the form of frequencies and percentages, as well as categorizing the level of experience and self-awareness of students (high, medium, low) (Alfianti et al.2023). Inferential analysis was conducted to test the research hypothesis. Before the hypothesis test was conducted, a normality test (using the Kolmogorov-Smirnov test) and a homogeneity test (using Levene's test) were first performed. If the assumptions were met, the hypothesis test was conducted using Pearson product-moment correlation to determine the relationship between cold lava flood experiences and students' self-awareness (Quraisy, 2022).

Result and Discussion

Experiences of MTsN 7 Tanah Datar Students with Lahar Disasters

The experience variable (X) was measured through a questionnaire distributed to 150 students of MTsN 7 Tanah Datar. This instrument was structured as a statement with Yes/No answers, based on three main indicators: direct experience, understanding of disaster characteristics, and disaster preparedness (Kartika et al. 2022).

Direct Experience

The direct disaster experience questionnaire consists of three questions. The results are shown in Figure 1.



Figure 1. Direct Experience

The figure above shows the distribution of direct experiences of MTsN 7 Tanah Datar students with cold lava disasters. Seventy percent of students reported

witnessing the 2023 cold lava event. Fifty-five percent still clearly remember the event, while 45% reported experiencing disruptions to school activities due to the lava disaster.

Interpretation of this diagram shows that the majority of students have actual experience with lava disasters. This is crucial for building disaster risk awareness, as direct experience tends to have a stronger influence on preparedness attitudes and behaviors than simply acquiring information from others.

Characteristics of Disasters

The disaster characteristics indicator involves three questions. The results are shown in Figure 2.

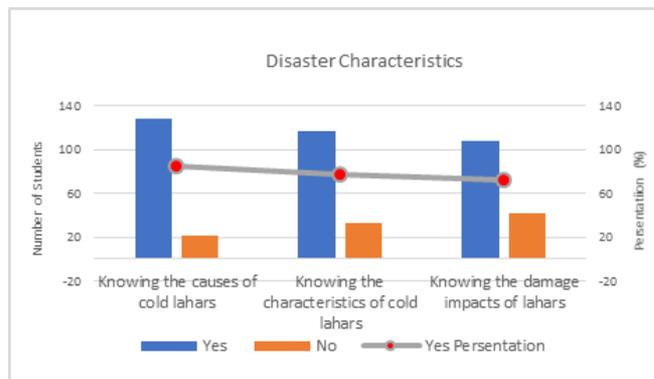


Figure 2. Disaster Characteristics

Figure 2 shows the characteristics of the Mount Marapi cold lava disaster understood by students through their experiences and information obtained. Questionnaire data from 150 respondents showed that 128 students (85%) knew that the cause of cold lava was high rainfall that carried eruption material into the river, 117 students (78%) understood the characteristics of cold lava in the form of a strong current mixed with rocks and sand, and 108 students (72%) were aware of the potential damage caused to bridges, houses, and public facilities.

Student Preparedness for Lahar Disasters

Preparedness is an important indicator in assessing students' ability to deal with potential disasters. These students were asked four questions, and the results are shown in Figure 3. Figure 3 A diagram of MTsN 7 Tanah Datar students' preparedness for a lahar disaster. This diagram shows that 65% of students know the evacuation route, 60% know the assembly point, 58% stated they were prepared if a disaster occurred again, but only 40% knew the first action when signs of a lahar appear. These results confirm that student preparedness still needs to be improved, especially regarding practical skills when dealing with early signs of a disaster.

After analyzing each indicator of the experience variable, it can be concluded that students at MTsN 7

Tanah Datar have diverse experiences with lava disasters. In the direct experience indicator, most students have witnessed a cold lava event directly and still clearly remember the event. In the disaster characteristics indicator, students' knowledge is classified as high because they are able to recognize the causes, characteristics, and impacts. Meanwhile, in the preparedness indicator, the results show a moderate category, where some students still do not know the first steps when signs of disaster appear.

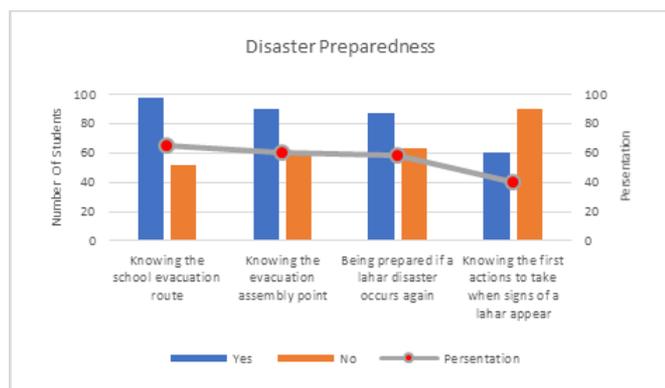


Figure 3. Disaster preparedness

To clarify the results of the three indicators, the following table presents a summary of the results of the MTsN 7 Tanah Datar students' experience variables regarding lava disasters.

Table 1. Recapitulation of the Results of Students' Experience Variable at MTsN 7 Tanah Datar Regarding Lahar Disasters

Indicator	High (%)	Moderate (%)	Low (%)	Dominant Category
Direct Experience	70	30	0	High
Disaster Characteristics	85	15	0	High
Preparedness for Disasters	60	40	0	Moderate

Table 1 shows that students' experience of lahar disasters is dominated by high scores in the direct experience (70%) and disaster characteristics (85%) indicators. This confirms that most students have real-world experience and a good understanding of the causes and characteristics of lahar disasters. However, the preparedness indicator is only in the moderate category (60%), indicating that some students are still not fully prepared to face the threat of lahars, particularly in terms of knowing the initial actions when signs of a disaster appear. Thus, overall student experience can be said to be high, but still requires strengthening in the aspect of practical preparedness in the school environment.

Self-Awareness of MTsN 7 Tanah Datar Students towards Lahar Disasters

The self-awareness variable instrument is arranged in the form of a questionnaire with answers *Of And No* distributed to 150 students at MTsN 7 Tanah Datar. This variable consists of three indicators: emotional self-awareness, accurate self-awareness, and self-confidence (Ardiansyah et al., 2023) The following are the results of the self-awareness variable.

Emotional Self-awareness

Student self-awareness instrument on indicator *emotional self-awareness* distributed to 150 students at MTsN 7 Tanah Datar. This indicator aims to assess the extent to which students understand their emotions and feelings when facing the threat of a lava disaster. The indicator consists of seven questions. The results are shown in Figure 4.

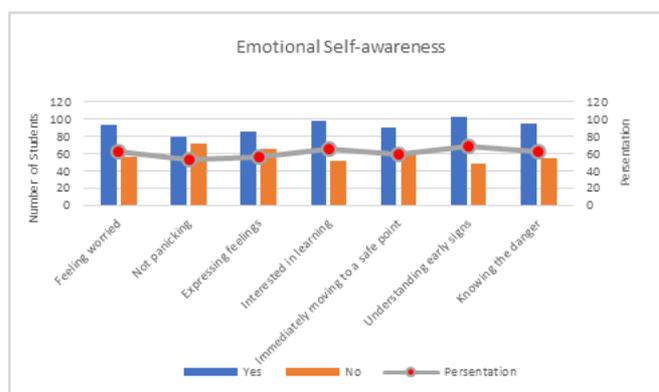


Figure 4. Emotional self-awareness

Figure 4 shows the distribution of answers from MTsN 7 Tanah Datar students regarding the indicators. *emotional self-awareness* of the 150 respondents, it was apparent that the majority of students had moderate levels of emotional awareness. First, 93 students (62%) expressed concern about a lava disaster occurring again. This figure indicates a high level of anxiety among students, which can encourage vigilance but also has the potential to cause panic if not balanced with preparedness.

Second, only 79 students (53%) stated that they did not panic when signs of disaster appeared. This percentage is relatively low, indicating that nearly half of students still tend to panic or become confused when faced with an emergency.

Third, the ability to express their feelings during a disaster was demonstrated by 85 students (57%), meaning that more than half of students were emotionally open, but not yet fully open.

Fourth, positive indicators are seen in interest in disaster learning materials (65%) and understanding of early signs of disaster (68%). Both indicators are

considered high, indicating that the majority of students have initial awareness and a desire to learn about disasters.

Finally, 90 students (60%) stated that they would immediately gather at a safe point during a disaster, and 95 students (63%) were aware of the dangers posed by lava. These results confirm that the majority of students understand the risks, although the implementation of concrete actions is still limited.

Accurate Self-Awareness

Indicators accurate self-awareness, this instrument was used to determine the extent to which MTsN 7 Tanah Datar students were able to objectively assess themselves in the face of a lava disaster. This instrument was distributed to 150 students in the form of a questionnaire Of And No. In this indicator there are 4 questions, the results are shown in the following diagram.

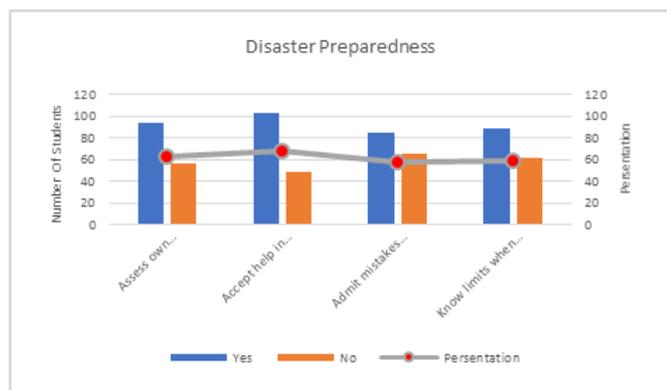


Figure 5. Accurate Self-Awareness

Figure 5 depicts the level *accurate self-awareness* Students of MTsN 7 Tanah Datar were measured using four indicators. Of the 150 respondents, the results were still predominantly in the moderate category. A total of 94 students (63%) stated they were able to assess their own strengths and weaknesses in the face of disasters. This indicates that most students are quite objective in recognizing their personal abilities. 102 students (68%) received help from others when a disaster occurred, which is the indicator with the highest percentage, indicating students' openness to working together in emergency situations. Only 85 students (57%) admitted to being able to admit their own mistakes or weaknesses during the evacuation process, indicating that there is still a tendency for students to cover up their shortcomings. As many as 88 students (59%) stated that they were aware of their limitations in making decisions during a disaster, which means that some students were aware of the limits of their abilities, but almost half were not yet aware of them.

Self-Confidence

Indicators self-confidence, this instrument is used to measure the extent to which students at MTsN 7 Tanah Datar are confident in their abilities to deal with lava disasters. This instrument is in the form of a questionnaire. Yes No distributed to 150 students. This indicator contains 4 questions.

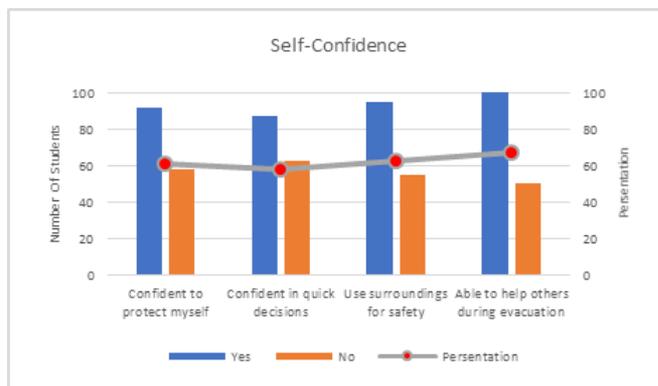


Figure 6. Self-confidence

Figure 6 shows the distribution of answers from MTsN 7 Tanah Datar students on the indicator self confidence Of the 150 respondents, most students had self-confidence that was still in the moderate category. A total of 92 students (61%) were confident they could protect themselves in the event of a disaster. This indicates that the majority of students already have a basic sense of self-confidence, although it's not yet fully developed. 87 students (58%) were confident in making quick decisions during a disaster. This percentage is still low, indicating that students tend to be hesitant or unsure when it comes to acting quickly in emergency situations. Ninety-five students (63%) stated they could use their surroundings, such as roads and safe spaces, to protect themselves. This indicates a relatively good ability to adapt. 100 students (67%) believe they can help friends or others during an evacuation, the indicator with the highest percentage. This indicates that mutual cooperation and solidarity remain quite strong among Student.

The Influence of the Experience of the Lahar Disaster on the Level of Awareness of Students at MTS Negeri 7 Tanah Datar Regency

Prerequisite Analysis Test

Normality Test

The normality test aims to determine whether the data from each research variable, namely Student Experience (X) and Self-Awareness (Y), whether it is normally distributed or not. The normality test in this study uses Kolmogorov-Smirnov Test. The decision-making criteria are if the significance value (Sig.) > 0.05 then the data is normally distributed, whereas if the

significance value (Sig.) < 0.05 then the data is not normally distributed.

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		150
Normal Parameters ^{a,b}	Mean	.0000000
	Std. Deviation	1.87010914
Most Extreme Differences	Absolute	.071
	Positive	.051
	Negative	-.071
Test Statistic		.071
Asymp. Sig. (2-tailed)		.060 ^c

a. Test distribution is Normal.
 b. Calculated from data.
 c. Lilliefors Significance Correction.

Figure 7. Normality test results table

Based on the results of the Kolmogorov-Smirnov test in Figure 7, a significance value of 0,060 > 0,05. This shows that the data Student Experience variable (X) And Self-Awareness (Y) normally distributed. Thus, the hypothesis analysis in this study can be continued using Pearson Product Correlation Moment because the assumption of normality is met.

Homogeneity Test

A homogeneity test is conducted to determine whether the variances of the research data are similar or not. Homogeneity of variance is important to ensure that the data meets the requirements for parametric statistical analysis. In this study, the homogeneity test was conducted using Levene’s Test of Equality of Error Variances on both variables, namely Student Experience (X) and Self-Awareness (Y), with grouping based on gender.

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
X	Based on Mean	3.421	1	148	.066
	Based on Median	2.563	1	148	.112
	Based on Median and with adjusted df	2.563	1	145.438	.112
	Based on trimmed mean	3.511	1	148	.063

Figure 8. Homogeneity Test of Variable X

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Y	Based on Mean	.152	1	148	.697
	Based on Median	.037	1	148	.847
	Based on Median and with adjusted df	.037	1	147.198	.847
	Based on trimmed mean	.149	1	148	.700

Figure 9. Homogeneity Test of Variable Y

Based on figures 8 and 9, the results of the homogeneity test of the variables Student Experience (X) shows a significance value of 0.066 > 0.05, while the variable Awareness (Y) shows a significance value of 0,697 > 0,05. Thus it can be concluded that the variance of the data in both variables, both variables Student Experience (X) and Self-Awareness (Y), is homogeneous.

Hypothesis Testing

Hypothesis testing aims to determine whether there is a significant relationship between Student Experience (X) with Self-Awareness (Y) regarding the lava disaster at MTsN 7 Tanah Datar. This hypothesis testing uses a statistical analysis. Pearson Product Moment Correlation, because the research data has fulfilled the prerequisite test requirements, namely being normally distributed and having homogeneous variance. The results of the correlation analysis between variables X and Y can be seen in the following image:

Correlations

		X	Y
X	Pearson Correlation	1	.193 [*]
	Sig. (2-tailed)		.018
	N	150	150
Y	Pearson Correlation	.193 [*]	1
	Sig. (2-tailed)	.018	
	N	150	150

*. Correlation is significant at the 0.05 level (2-tailed).

Figure 10. Correlation test for variables X and Y

The image shows the results of the Pearson correlation test between the variables Student Experience (X) And Self-Awareness (Y). The correlation coefficient value obtained is 0,193 with the number of respondents 150. Based on the r-table value at a significance level of 5% with a sample size of 150, namely 0,159, then the results obtained are that count (0.193) > r table (0.159). Thus, there is a relationship between the variables of Student Experience and Self-Awareness.

The correlation formed is of a nature positive by category low, meaning that the higher the students' experience regarding lava disasters, the higher the students' self-awareness in facing the disaster, even though the strength of the relationship is still relatively weak. The significance value is 0,018 < 0,05 further strengthening that this relationship is statistically significant.

Judging from the distribution of respondents' answers, the student self-awareness category shows quite a large variation. Of the total of 150 students, as many as 65 students (43.3%) is in the category currently,

50 students (33.3%) is in the category high, And 35 students (23.3%) is in the category low. This indicates that nearly half of the respondents still have a suboptimal level of self-awareness, even though most of them have had direct experience with lava disasters.

Thus, it can be concluded that the variable Student Experience (X) And Self-Awareness (Y) These relationships are interrelated and significant, although weak. These results demonstrate the importance of enhancing disaster education programs in schools to strengthen students' self-awareness in facing disaster threats.

Conclusion

The results of this study show that students' experiences with lahar disasters at MTsN 7 Tanah Datar are generally high, as most have directly encountered lahar events, understand their causes and characteristics, and are familiar with evacuation locations, although their practical preparedness remains at a moderate to low level; students' self-awareness is also in the moderate category, reflected through their concern and interest in disaster knowledge, their ability to assess personal strengths and weaknesses, and their moderate confidence in dealing with emergencies; the Pearson correlation analysis indicates a positive and significant relationship between disaster experience and self-awareness ($r = 0.193$; $p = 0.018$), although the strength of the relationship is weak, thus supporting the research hypothesis; these findings emphasize the need to strengthen disaster education through simulations, evacuation drills, and practice-based learning so that students' experiences can effectively enhance their self-awareness and real preparedness.

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Conflicts of Interest

The authors declare no conflict of interest.

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