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The Influence of Students' Attribute on Earthquake Understanding in Klaten Regency

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ABSTRACT
An earthquake is a type of natural disaster that cannot be predicted in terms of time or scale. Klaten Regency is one of the earthquake-prone areas of Indonesia. The occurrence of earthquakes in Klaten Regency has indeed been a matter of surprise for many parties. Implementing disaster mitigation measures is crucial in areas prone to disasters. Disaster mitigation education has been implemented in schools through intracurricular and extracurricular activities. This study aims to analyze (1) the students' understanding of earthquake at the elementary, middle, and high school levels in Klaten Regency and (2) the impact of student attributes on understanding of earthquake. Students' attributes comprise of age and gender. This is a quantitative study with a correlational research approach. The study's sample size was 173 students from junior high school. Techniques for collecting data include questionnaires and documentation. Data analysis techniques employ descriptive statistics furthermore, the tests used to answer the hypothesis are the mann whitney test, kruskall wallis, and spearman rank. The Mann Whitney test. According to the results of the study, (1) students' knowledge of earthquakes was 22% high, 75% moderate, and 3% low and (2) The test results pointed out that student characteristics had no significant impact on students' earthquake knowledge.

INTRODUCTION

An earthquake is an event of movement of the earth's surface, one of which is caused by tectonics plate energy. Java Island is one of

be separated from the role of schools. Through schooling, students gain various essential knowledge related to earthquake risk reduction. Students are generally children who are vulnerable to disasters, so the risk of students becoming victims is greater the islands in Indonesia located in a subduction zone that stretches on the south side from the western end to the eastern end. This zone makes Java Island prone to natural disasters, including earthquakes (Saputra et al., 2018). In addition to the conditions of the zone, diverse topographic conditions can also cause potential disasters (Mustikaningrum et al., 2023). An earthquake is one type of disaster that cannot be predicted when and where it occurs. High-scale earthquakes have great potential to cause infrastructure damage and loss of life. Disasters may pose physical and psychological impacts on victims, as well as cause trauma (Hong & Efferth, 2016). When disaster occurs, victims become trapped in a situation of confusion and uncertainty about how to save themselves (Hughes, 2012) therefore physical and nonphysical mitigation are an essential part of disaster risk reduction, including change of arrangement of human settlements (El-Masri & Tipple, 2002).

One of the earthquake events in Java Island occurred in Klaten Regency in 2006 (Qomarun, 2017). In Klaten Regency, the earthquake severely impacted several districts, including Bayat District, Wedi

District, Prambanan District, and Gantiwarno District. This earthquake event surprised various parties because the quake was one of the events that might not have been expected to occur in Klaten Regency. This earthquake was caused by the collision of two earth plates, namely the Indo-Australian and Eurasian plates, in the south of Java Island (Masykur, 2006). In addition, in the Klaten Regency, there are active faults, including the Opak Fault (Kristanto et al., 2021) and the Dengkeng Fault (Prasetyadi et al., 2011). The epicenter of the earthquake in 2006 was on the south side of the Special Region of Yogyakarta (DIY) with a depth of 33 km below the surface of the Parangtritis Beach area, Bantul Regency, DIY (Wulandari, 2018). The earthquake had a magnitude of 5.9 on the Richter scale, which caused damage to infrastructure and casualties (DIBI BNPB, 2006). Furthermore, DIBI BNPB data (2006) shows the number of victims in Klaten Regency in this event: as many as 1045 people died, 18,127 were injured, and 713,788 were displaced. Furthermore, the infrastructure damage caused included 32,277 houses severely damaged, 63,615 lightly damaged, 298 school facilities damaged, 111 health facilities damaged, and 945 offices damaged. In addition to physical damage and casualties, earthquake events can psychologically impact victims (Masykur, 2006).

Disaster management can be done through various efforts, including education. In the Klaten Regency itself, a regent regulation related to the regional action plan for disaster risk reduction in the Klaten Regency for 2022-2024 has been issued. Several disaster-prone schools have implemented disaster risk reduction efforts in the district, including developing SPAB, SWALIBA (School with Environmental Insight and Disaster Mitigation), disaster extracurriculars, integration with scouts, etc. Schools provide disaster education and a sense of security, calmness, and hope to face disasters (Mooney et al., 2021). Disaster mitigation education in schools can shape the character of being ready to face disasters so that later, it can shape students' capacity to deal with earthquake disasters (Midtbust et al., 2018). Disaster mitigation education in schools provides opportunities for children to gain experience participating in genuine disaster risk reduction efforts to be ready to face small to large-scale disasters (Mutch & Gawith, 2014). One of the ways disaster capacity can be obtained is if students have good knowledge about disaster mitigation. Students should have disaster mitigation capacity to reduce the risk of becoming victims of disasters (Freeman et al., 2015). Students can also be Agents of Change In disaster risk reduction at the family level because disaster education is not only for students, disaster mitigation education in schools can be distributed to family members (Tuladhar et al., 2014; Fuhrmann et al., 2008).

The implementation of disaster education cannot (Adebäck et al., 2018; Mohammadinia et al., 2018). Attention to children as a vulnerable group is required because children have a high risk of becoming victims in disaster events (Dyregrov et al., 2018). In addition, previous research has shown the need for more attention to disaster-prone groups from the point of view of gender (men and women) (Denton, 2002). This is because men and women require different attention and needs in disaster events (Gaillard et al., 2017). Furthermore, disasters befall victims unequally because of the characteristics of each distinct group, such as men and women, the elderly, toddler groups, and other vulnerable groups (Neumayer & Plümper, 2007; Juran & Trivedi, 2015).

Disaster education is essential in increasing disaster resilience and reducing casualties in disaster events (Ru Gwee et al., 2011). There is a growing urgency to involve children in disaster risk reduction (Krishna et al., 2022) because children are often seen as passive in disaster risk reduction. Various literature shows that children can be actively involved in disaster learning (Pant, 2023; Mudavanhu et al., 2015). The involvement is in the form of participation in improving disaster management capacity for children (Cumiskey et al., 2015). This capacity will play a role in reducing the risk of child

casualties in disaster events. One form of students' disaster capacity is knowledge of the disaster itself. Knowledge about disasters is an important aspect that fosters a culture of safety and disaster awareness, including children (Lopez et al., 2012). Children's knowledge of the nature of disasters and what to do during disasters can play a role in reducing child casualties in disaster events (Muzenda-Mudavanhu et al., 2016). Efforts can be made to increase students' knowledge of disaster risk reduction through integration into the learning process. In the curriculum, disaster risk reduction efforts manifest in disaster learning outcomes at the junior and senior secondary levels. This material is a form of curriculum change due to the need for disaster risk reduction for people living in disaster-prone areas. This disaster material can be integrated into school geography subjects (Zavar & Nelan, 2020; Sharpe & Kelman, 2011).

Various important factors contribute to learning success in the learning process, including students' metacognition abilities, motivation, self-efficiency (Feng Teng et al., 2021), background, and student characteristics (Mutlu & Yıldırım, 2019). In addition to these factors, sex differences are another factor (Yang & Quadir, 2018). In addition to gender, (Yang et al., 2016) found that age is essential to learning. Age is assumed to influence how a person learns, so it becomes a factor in learning success (Yang et al., 2016). Previous research examining gender and age has been carried out, as well as research by (Yang et al. (2016), who studied the influence of age and gender on learning success (Delgoulet & Marquié, 2002) and examined differences in learning ability based on age, Davenport, (1986) focused in the influence of gender and age on learning styles, Borun et al., (2010) examine the influence of learning style, age, and gender on the choice of learning activities. (Rončević Zubković et al., 2023) focused on the influence of age and gender on learning motivation. These studies examine the variables of age and gender that influence learning style or success. In addition, studies that examine age and gender in disasters have also been conducted by several researchers, including (Neumayer & Plümper, 2007), assessing disaster vulnerability in terms of gender. (Ray-Bennett, 2009) examined the influence of caste, class, and gender on the ability to deal with disasters, and (Smyth, 2009) assessed the appropriate disaster programs based on gender. Based on previous research, the focus of studies on gender and age is the influence of vulnerability and disaster programs, however, there has been no research that examines the influence of gender and age together on knowledge of disasters. Based on this, research on gender and age in disasters is essential. The objectives of this study are to (1) know the level of knowledge of earthquake disasters students, (2) know the influence of gender partially on students' disaster knowledge, (3) know the effect between ages partially on students' disaster knowledge, and (4) knowing the influence of gender and age together on students' disaster knowledge. The hypothesis in this study is to answer the fourth research objective, with the sound of the hypothesis that there is a significant influence between gender and age on student knowledge.

RESEARCH METHODS

This research is a quantitative research with a correlational design. This research was conducted at SMP Negeri 1 Bayat. This school was chosen because it is in an earthquake-prone location and has been affected by earthquakes. The school location is presented in Figure 1.

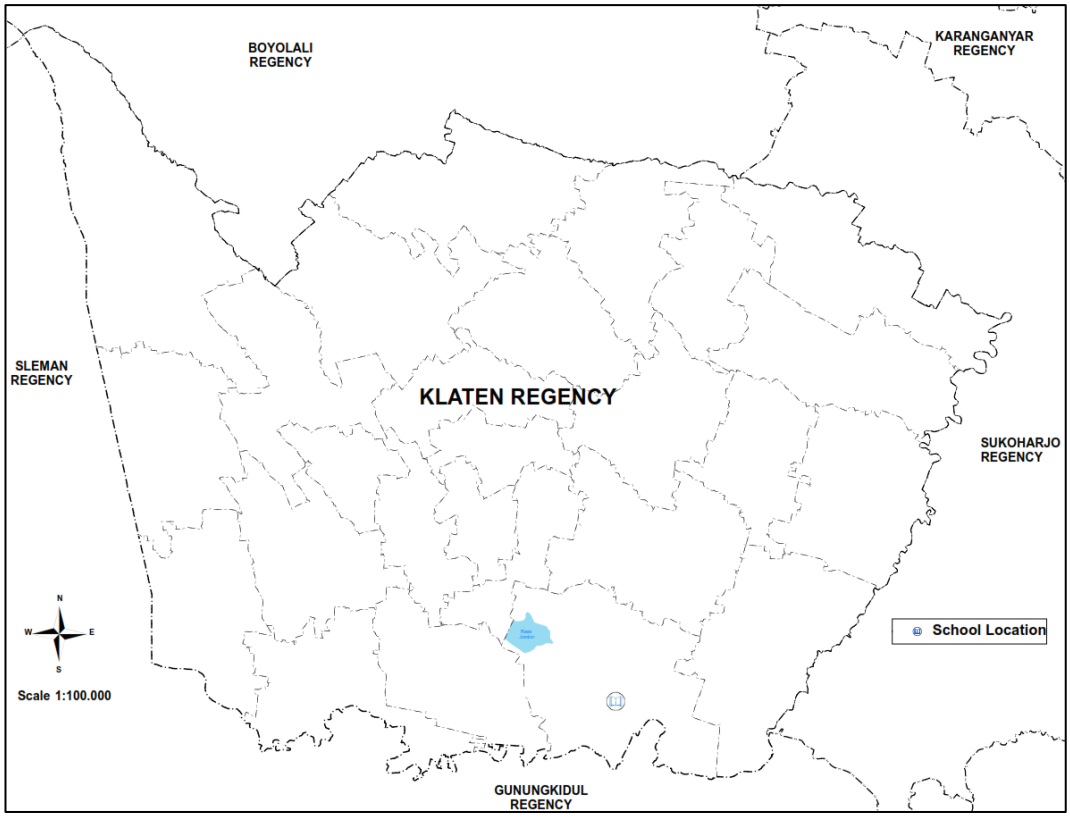

Figure 1. Map of School Location (Source: Data Processing, 2023)

This study's participants were 173 students from grades 7, 8, and 9. Attributes measured in the study included age and gender. Data collection uses tests to measure students' knowledge of earthquake disasters. The test questions from the LIPI preparedness questionnaire (2006) regarding disaster preparedness based on disaster knowledge parameters were modified. The question consists of 9 indicators with 37 questions. The indicators of this problem are presented in Table 1.

Table 1. Indicators of Earthquake Knowledge

No.	Indicators	Question Number
1	Definition of disaster	1,2,3,4
2	Causes of disaster	5,6,7,8,9,10
3	Causes of earthquakes	11,12,13,14,15
4	Earthquake impact	16,17,18,19,20,21,38
5	Time of disaster	22
6	Characteristics of earthquake disasters	23,24,25,26
7	Earthquake disaster mitigation	27,28,29,30,31
8	Earthquake disaster education	32,33,34,35,36,37

(Source: Modification of LIPI, 2006)

The score used is 1 for correct answers and 0 for incorrect answers. Data analysis techniques include prerequisite analysis tests and correlational tests. The prerequisite tests of the analysis used are normality and homogeneity tests. For correlational tests using Pearson's product-moment correlation parametric test, if the analysis prerequisite test is not met, the correlation test used is the non-parametric Mann-Whitney, Kruskall Wallis, and Spearman Rank tests.

RESULTS AND DISCUSSION

Descriptions of respondents

Respondents in the study amounted to 173 students consisting of 83 (47.9%) male students and 90 (52.1%) female students. Students consist of grades 7, 8, and 9 with an age range of students between 13-17 years with an age distribution of 13 years (15.6%), 14 years (43.4%), 15 years (38.2%), 16 years (1.7%), and 17 years (1.2%). Due to the implementation of the zoning system in student admissions, student residences around the school location include Bayat District (82.7%), Cawas District (11.6%), Wedi District (2.9%), Trucuk District (0.6%), and Wonosari District (0.6%).

Students' knowledge of earthquake

Measurement of students' knowledge is carried out through the provision of disaster knowledge tests. Based on the results of data analysis, the classification of students' knowledge about earthquakes can be known in the high (22%), moderate (75%), and low (3%) categories. The minimum score is 26, and the highest score is 72, with the maximum score if all questions are answered correctly is 96. The score is converted with a maximum constant score of 100, resulting in the student's knowledge score. The average knowledge score of the students was 58.5.

Table 2. Students' Attributes

Attributes	Attributes Classification	Total	Percentage (%)
Gender	Male	83	47.9
	Female	90	52.1
Age	13 years old	27	15.6
	14 years old	75	43.4
	15 years old	71	41
Region Origin	Bayat District	143	82.7
	Cawas District	20	11.6
	Wedi District	5	2.9
	Other subdistricts	5	2.9

(Source: Primary Data, 2022)

Table 3. Average and Standard Deviation of Student Knowledge

Attributes	Attributes Classification	Total	Mean	SD	Min. Score	Max. Score
Gender	Male	84	59.1	12.9	27	75
	Female	89	62.7	6.8	29	75
Age	13 years old	27	56.6	17.5	44.8	70.8
	14 years old	75	63.9	7.8	29.2	75
	15 years old	71	58.7	8.6	27.1	71.9
Region Origin	Bayat District	143	61	10.3	27.1	74
	Cawas District	20	56.5	10.8	29.2	75
	Wedi District	5	62.3	5.9	54.2	69.8
	Other Subdistricts	5	65.4	63.1	58.3	75

(Source: Primary Data, 2022)

According to data from Table 3, female students exhibit a higher average level of disaster knowledge than male students. Additionally, the average disaster knowledge at age 14 surpasses other age groups. The student's knowledge about the earthquake is presented in Figure 1 below.

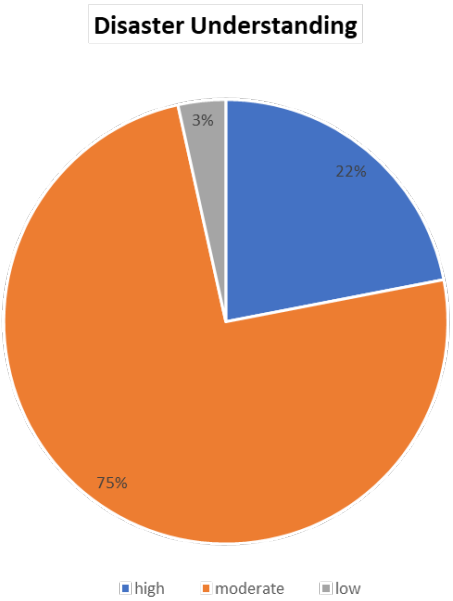

Figure 1. Percentage of students' level of knowledge of earthquake (Source: Data Researcher, 2023)

This study classified students' knowledge into three categories: high, moderate, and low. The results of the analysis showed that 129 (75%) students were included in the mild category, 38 (22%) students were included in the high category. As many as 6 (3%) students were included in the low category.

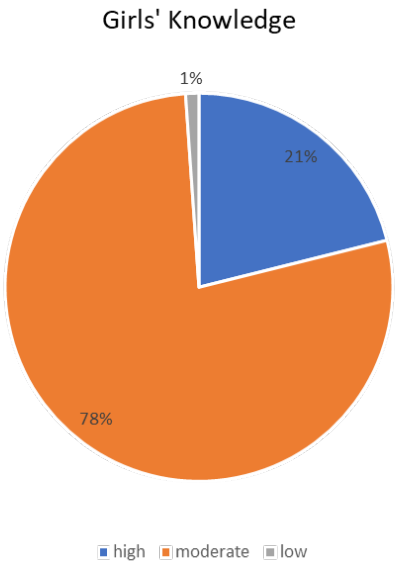

Figure 2. Percentage of female student knowledge (Source: Data Researcher, 2023)

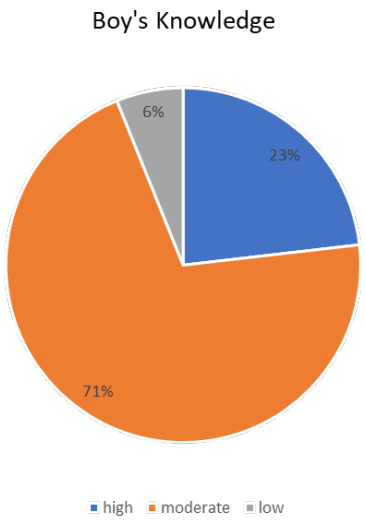

Figure 3. Percentage of student knowledge (Source: Data Researcher, 2023)

The results of the analysis showed the distribution of knowledge among male and female students about the earthquake disaster. The percentage of expertise at a high level in female students is 19 students (21%) and in male students is 19 students (23%), knowledge at a moderate level in female students is 70 students (78%), and knowledge at a low level is one student (1%). In male students, the distribution of students' knowledge levels includes a high level of 19 students (23%), a moderate level of 59 students (71%), and a low level of 5 students (6%). Female students answered correctly the most about events that triggered disasters and caused earthquakes, while male students answered correctly the most about aspects that caused earthquakes. It can be concluded that students have good knowledge about the causes of earthquakes. Female students' understanding of natural disasters and the impact of tsunamis due to earthquakes could be higher. Male students' knowledge could be higher in understanding natural disasters, the impact arising from earthquake disasters, and the time of earthquakes. It can be concluded that the similarity of knowledge between male and female students is the lowest in understanding natural disasters and other impacts caused by earthquakes.

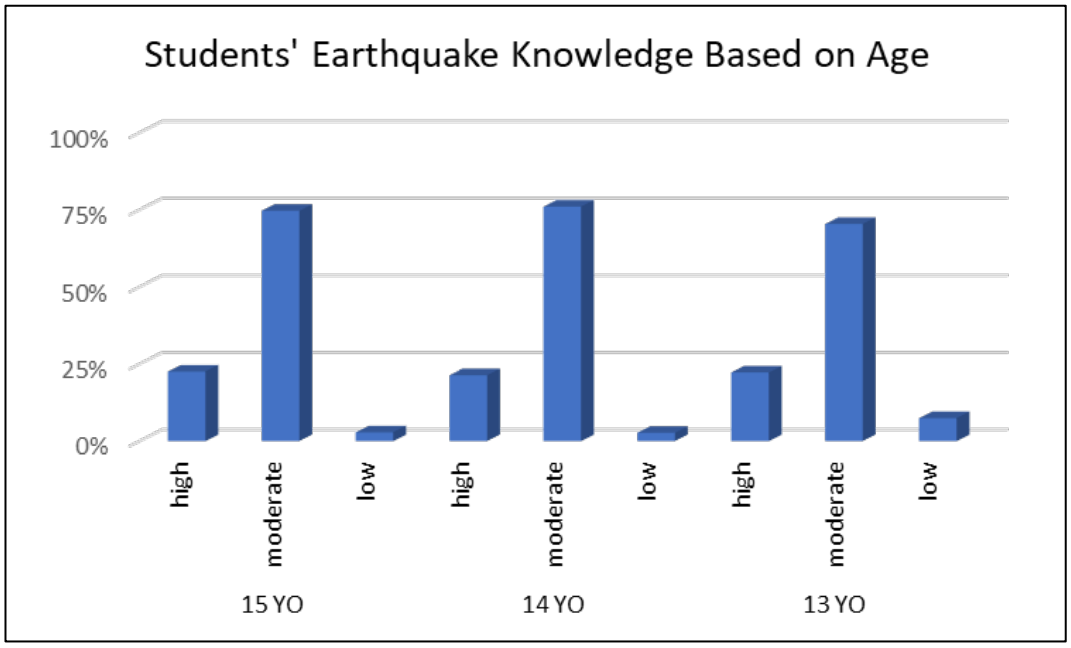

Figure 4. Students' Earthquake Knowledge Based on Age (Source: Data Researcher, 2023)

The age of students is divided into three classifications, namely 13 years old (grade 1 junior high school), 14 years old (grade 2 junior high school), and 15 years old (grade 3 junior high school). So, despite the close age gap, this study emphasizes the role of each grade level in student knowledge. The analysis showed that students' average knowledge of earthquake disasters based on age was moderate (74%). The distribution of knowledge among students at the age of 15 years includes moderate (75%), high (23%), and low (3%). At age level 14, students' knowledge levels include moderate (76%), high (21%), and low (3%). At the age level of 13 years, it was found that the distribution of students' knowledge included moderate (70%), high (22%), and low (7%) categories. Students at the age of 15 answered correctly the most on aspects of events that can trigger disasters and the causes of disasters. At 14, students answered correctly the most on events that could trigger a disaster. At 15, students correctly answered most of the questions about the events that triggered the disaster. Based on these results, it can be concluded that students at all age levels answered the most correctly about aspects of events that trigger disasters. At 15, students have a higher knowledge of understanding natural disasters. At the age level of 14 years, students' knowledge is the least on impact caused by earthquake disasters. At 13, students have the lowest knowledge of the causes of earthquakes and other effects caused by earthquake disasters. Based on these results, it can be concluded that based on the age level, students' knowledge is lowest in understanding natural disasters and other impacts caused by earthquake disasters.

Based on these results, it can be concluded that based on gender, students' knowledge is best on the causes of earthquakes and the best knowledge at the age level. Students learning is lowest based on gender in understanding natural disasters and other impacts caused by earthquake disasters. This lowest aspect of knowledge is the same at all age levels. In general, students' learning is best on the causes of disasters and lowest on understanding natural disasters and other impacts caused by earthquakes.

Analysis Prerequisite Test for Correlational Test

The requirements for non-parametric tests in this study are normality and homogeneity tests. The results of this prerequisite test will determine whether a parametric test can be performed. If the prerequisite tests are not met, non-parametric tests of Mann Whitney, Kruskall Wallis, and Spearman Rank will be used.

Normality Test

Due to the large number of samples, to determine the normality of data using the Kolmogorov Smirnov test with the results presented in Table 4 below:

Table 4. Test Data Normality

Attribute	Test with Kolmogorov-Smirnov		
	Statistics	Df	Sig.
Gender	.351	173	.000
Age	.263	173	.000
Knowledge	.215	173	.000

(Source: Data Analysis, 2023)

Table 3 shows that the significance value of each variable in this study is 0.000, which means < 0.005, so it can be concluded that the data is abnormally distributed. At this stage, the test of the classical normality assumption is not satisfied.

Homogeneity Test

To find out the homogeneity of the data using the Levene test. The homogeneity test results are presented in Table 5 below:

Table 5. Data Homogeneity Test

Attribute	Test with Levene			
	Levene Statistic	df1	df2	Sig.
Gender	8.044	1	171	.005
Age	4.954	2	170	.008

(Source: Data Analysis, 2023)

The homogeneity test results show that the significance value on the gender influence variable is 0.005, and the age variable is 0.008, which means > 0.005, so it can be concluded that the data is homogeneous. However, parametric tests cannot be used because the normality test is unmet. Furthermore, the tests used to answer the hypothesis are the Mann-Whitney test, Kruskall Wallis, and Spearman Rank. The Mann-Whitney test measures the influence on gender variables, the Kruskall-Wallis test for the influence test on age, and the Spearman Rank test for the influence test of two gender and age variables.

The Influence of Gender

The genders referred to here are male and female. This study had 84 male students and 89 female students. The results of the test of the effect of gender on students' earthquake disaster knowledge are presented in Table 6.

Table 6. Test the Influence of Gender on Knowledge

Gender Classification	N	Sum of Rank	Mean Rank	U	Z	P
Male	84	6876	82.84	3390		
Female	89	8175	90.83	6876	-1.050	0.293

(Source: Data Analysis, 2023)

Based on the results of non-parametric statistical tests with Mann Whitney, the significance value was 0.293, which means > 0.005. Thus, it can be concluded that gender significantly influences students' knowledge of earthquake disasters.

The Influence of Age

Age is divided into three levels, namely 13, 14, and 15. Because the age categories are more than two, the Kruskall-Wallis test is used. The results of this age effect test are presented in Table 7 below:

Table 7. Test the Effect of Age

Age levels	N	Mean Rank	P
13	27	78.48	
14	75	87.53	
15	71	89.68	0.608

(Source: Data Analysis, 2023)

The test results with Kruskall Wallis found that the significance value was 0.608, which means > 0.005, which means no significant effect between ages on students' disaster knowledge.

The Influence of gender and age

The Spearman Rank test was used to answer the hypothesis in this study. The Spearman rank test is a non-parametric test to measure the influence of gender and age on students' earthquake disaster knowledge. The results of this test are presented in Table 8 below:

Table 8. Test the Influence of Gender and Age

Atributes	Correlation	Knowledge	Age	Gender
Knowledge	Correlation coefficient	1.000	.065	.080
	Sig. (2-tailed) N	.	.398	.295
	N	173	173	173
Age	Correlation coefficient	.065	1.000	-.116
	Sig. (2-tailed)	.398	.	.129
	N	173	173	173
Gender	Correlation coefficient	.143	-.113	1
	Sig. (2-tailed) N	.61	.140	.
	N	173	173	173

(Source: Data Analysis, 2023)

The results of the Spearman rank test show a significance value of> 0.05, so it can be concluded that gender and age do not influence students' knowledge of earthquake disasters.

Table 9. The Influence of Students' Attributes on Disaster Knowledge

Aspect / Attributes	Gender	Age	Age & Gender
Disaster Knowledge	Yes	No	No

(Source: Data Analysis, 2023)

Based on the results of partial statistical tests analyzing age and gender variables, we found that the age variable significantly influenced students' disaster knowledge. However, the gender variable had no effect. Specifically, male students with sound knowledge surpassed female students by a margin of 3%.

Based on age, students' knowledge tends to be consistent across different age levels, with no significant differences observed. When testing gender and age variables together, we found no significant influence on disaster knowledge. Consequently, we can conclude that gender factors, independent of other variables, primarily influence students' understanding.

Knowledge about disasters is one of the essential aspects that everyone must possess, especially those living in areas prone to disasters. This knowledge is part of the community's capacity to reduce the risk of disaster casualties. Knowledge of catastrophes will also be better if integrated with knowledge of local culture; although challenging, it will provide significant benefits in disaster risk reduction (Kelman et al., 2012). Children are one of the vulnerable groups in disasters. Therefore, children need special attention in disaster risk reduction efforts (Amri et al., 2018). Earthquakes are one type of disaster that has a significant impact on children. Reducing the effect through disaster mitigation education and increasing knowledge can also improve students' emotional readiness (Raccanello et al., 2021). Efforts that can be made to increase the capacity of children in disasters include improving students' knowledge of earthquakes by integrating students' learning in extracurricular activities. Through disaster education, proper expertise about disasters will be obtained (Wibowo et al., 2023). In Klaten Regency, disaster mitigation education has been integrated into classroom and through extracurricular learning. Special disaster mitigation programs have also been incorporated into Klaten District schools.

The results showed that, in general, students' knowledge of earthquake disasters was in the moderate category (75%), while based on gender, the average knowledge of students was included in the mild category (78%). The average knowledge based on age was included in the moderate category (74%). This means that there are still some aspects that students still need to learn about earthquake disasters. According to 's (2014) article, children must know a lot about disasters, such as when disasters occur, disaster prevention, and participation in disaster training.

The results showed that based on gender, students' knowledge of the causes of earthquakes was the best and the best knowledge at the age level. Based on gender, the lowest aspect of knowledge is the same at all age levels. In general, students' learning is best on the causes of disasters and lowest on understanding natural disasters and other impacts caused by earthquakes. It can be concluded that junior high school students in Bayat need more intensive learning to increase their understanding of the nature and continued impact that occurs due to earthquake events. Disaster mitigation education can improve students' knowledge and foster preparedness and skills needed for disaster management (Izquierdo-Condoy et al., 2023).

In this study, it was found that there is an influence between gender and knowledge. Gender is a critical aspect of disaster. Disaster experiences affect men and women differently (Juran &; Trivedi, 2015). In disaster management, it is necessary to pay attention to gender so that it can carry out appropriate handling (Saito, 2012). Furthermore, research shows no influence between gender and knowledge. Research showed that attitudes toward disasters influence knowledge about disasters; positive attitudes toward disaster preparedness influence students' understanding. Gender and age do not significantly affect students' knowledge of earthquake disasters.

CONCLUSION

Students' knowledge of earthquake disasters is divided into the moderate category (75%). Based on gender and age of knowledge, students are also included in the mild category. The results of the correlational test showed that students' knowledge is influenced by gender; however, it is not influenced by age. Gender and age did not affect students' knowledge of earthquake disasters. Students' knowledge is best on the causes of disasters, while the lowest is on understanding disasters and the continued impact of earthquake disasters. Based on these results, researchers suggest a program to increase students' earthquake disaster knowledge, especially those related to its nature and effect.

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