

Assessing The Impact of Digital Media on Disaster Awareness in Secondary School Students

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Abstract

This study aims to analyze the influence of digital media utilization on students' disaster knowledge at SMP Negeri 1 Grogol, Sukoharjo. This research employed a quantitative correlational design with 283 students selected via stratified random sampling. Data were collected through observation, tests, questionnaires, and documentation, and were analyzed using Spearman's rho correlation to examine the relationship between the two variables. The results showed that students' level of digital media utilization was moderate, while their level of disaster knowledge was high. The correlation test indicated a coefficient of $r = 0.155$ ($p = 0.008$), suggesting a positive, significant relationship between digital media use and disaster knowledge, though the relationship was weak. These findings indicate that digital media enhances students' understanding of disasters, yet it is not the sole factor influencing disaster knowledge. Therefore, optimizing the use of digital media in disaster education is necessary to support more effective improvements in students' disaster literacy.

Keywords: Digital Media; Disaster Knowledge; Disaster Education; Disaster Preparedness.

A. Introduction

A disaster is an event that can threaten human life and livelihoods, and its causes can be natural, non-natural, or human-induced (Sudrajat, 2016). A natural disaster is defined as an event that has a significant impact on the human population (Hardiyanto & Pulungan, 2019) and is generally unavoidable. Some disasters can be prevented, but most require increased preparedness efforts to minimize their impact (Maharani, 2023). Law No. 24, 2007, also classifies disasters into three categories: natural disasters, non-natural disasters, and social disasters, each of which can cause both material and non-material losses to communities. Examples of natural disasters include floods, landslides, earthquakes, droughts, and volcanic eruptions, while non-natural disasters include technological failures, epidemics, and large fires.

These various disasters impact not only the physical and environmental aspects but also the education sector. Disasters can damage school facilities, disrupt teaching and learning, and hinder student development (Lesmana & Purborini, 2019). Floods, for example, can reduce learning time, increase the risk of water-borne diseases, and reduce academic achievement (Purwani et al., 2019). Furthermore, children are a vulnerable group because they lack a thorough understanding of the risks around them, leading to low levels of preparedness (Sukanto et al., 2021). The finding further reinforces the high risk of disasters in educational settings, as approximately 75% of schools in Indonesia are located in disaster-prone areas (Sisdiana et al., 2020). This situation underscores the need to integrate disaster management into education to build a culture of risk awareness and enhance student resilience.

With technological advancements, digital media has become a crucial part of the learning process. Advances in digital technology impact nearly every aspect of human life, including the delivery of disaster education materials (Firmadani, 2020). Digital media offers advantages such as widespread access, flexibility of use, and the ability to deliver more interactive learning (Gandang Gunanto, 2021). Various digital platforms can present disaster information in a visual, engaging, and easily understood way for students, thereby increasing their engagement and understanding of disaster issues (Jediut et al., 2021). Furthermore, students' ability to use and interpret information through digital platforms is a crucial skill in the current era of digital transformation (Mei Fita et al., 2023). Therefore, the use of digital media has significant potential to support more effective disaster mitigation education.

SMP Negeri 1 Grogol Sukoharjo is a school located in a flood-prone area, yet it has relatively adequate digital technology infrastructure. It opens up significant opportunities for the school to utilize digital media to enhance students' disaster knowledge. However, further in-depth studies are needed to determine the extent to which students have used digital media and how this use impacts their level of disaster knowledge. The lack of information on this issue indicates a

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research gap that needs to be filled, particularly regarding the effectiveness of digital media in improving disaster literacy among junior high school students. Based on this description, this study aims to analyze the influence of digital media utilization on students' disaster knowledge at SMP Negeri 1 Grogol, Sukoharjo. The results are expected to provide an empirical overview of the role of digital media in disaster education and serve as a reference for schools in designing more adaptive and effective learning strategies.

B. Research Method

This study used a quantitative correlational design to analyze the relationship between digital media use and students' disaster knowledge. The quantitative approach was chosen because all collected data were numerical and analyzed statistically. The correlational design was used to determine the direction and strength of the relationship between variables without providing any specific treatment to respondents. The study was conducted at SMP Negeri 1 Grogol Sukoharjo, Sukoharjo Regency, Central Java. This school is located in a flood-prone area, making it a relevant context for assessing disaster knowledge and the use of digital media as a source of disaster information. The study lasted six months and included planning, instrument development, data collection, analysis, and report preparation.

The study population consisted of 956 students in grades VII, VIII, and IX. Sampling was conducted using stratified random sampling, which randomly selects samples while maintaining the proportions at each grade level. The use of this technique ensures that all student groups are proportionally represented. Based on calculations using the Slovin formula, a sample of 283 students was selected, then distributed to each class stratum according to the population proportions. Data collection in this study was carried out using several techniques, namely observation, tests, questionnaires, and documentation. Observations were carried out systematically to obtain a direct picture of student activities, school environmental conditions, and situations related to the use of digital media and disasters. The test was used to measure students' disaster knowledge through multiple-choice questions covering understanding of disaster types, causes, signs, impacts, mitigation, evacuation steps, and disaster technology. This test instrument has undergone validity and reliability testing during the thesis preparation stage. In addition, a questionnaire was used to collect data on students' use of digital media. This questionnaire contains closed-ended statements structured based on variable indicators and distributed proportionally to the sample. Documentation was used as a supplement to obtain information through photographs, field notes, and school documents relevant to the research.

Table 1. Digital Media Utilization Instrument Grid

No.	Digital Media Utilization Indicators	Number of questions
1.	Frequency of digital media use.	3
2.	Variety of digital media used.	5
3.	Intensity of disaster information searches.	3
4.	Accessibility of digital media.	4

Table 2. Disaster Knowledge Instrument Grid

No.	Disaster Knowledge Indicators	Number of questions
1.	Understand and identify disasters.	2
2.	Understand the types of disasters.	2
3.	Understand the impacts of disasters.	2
4.	Understand digital disaster media.	3
5.	Understand the benefits of disaster education.	3
6.	Understand disaster technology tools.	2

The Digital Media Utilization instrument consists of 11 statements representing three leading indicators of the level of digital media utilization variable, namely: (1) frequency of digital media use, (2) variety of digital media used, and (3) intensity of disaster information searches. Validity testing was conducted by looking at the Corrected Item–Total Correlation value. Most items had correlation coefficients above the *r*-table (0.355; *n* = 31), so they can be considered valid for measuring digital media utilization.

Table 3. Validity Test of the Digital Media Utilization Instrument

Item	Corrected Item–Total Correlation
P01	0.468
P02	0.322
P03	0.614

P04	0.258
P05	0.383
P06	0.246
P07	0.440
P08	0.372
P09	0.468
P10	0.243
P11	0.726
P12	0.291
P13	0.573
P14	0.711
P15	0.606

Source: Data Analysis, 2025

The reliability test for the Digital Media Utilization instrument showed a Cronbach's Alpha value of 0.833. This value falls in the outstanding reliability category, indicating that the P instrument has strong internal consistency and is suitable for research.

Table 4. Reliability Test of the Digital Media Utilization Instrument

Cronbach's Alpha	Number of Items
0.833	15

Source: Data Analysis, 2025

The Digital Media Utilization instrument (specifically for measuring digital media accessibility indicators) consists of four statements as part of the digital media utilization level variable. Validity testing was conducted through Corrected Item–Total Correlation analysis, and all items (A01–A04) had correlation values greater than the r-table (0.355). Thus, all items in instrument A were declared valid.

Table 5. Validity Test of the Digital Media Utilization Instrument

Item	Corrected Item–Total Correlation
A01	0.690
A02	0.429
A03	0.710
A04	0.653

Source: Data Analysis, 2025

The reliability test showed a Cronbach's Alpha of 0.796, indicating that the Digital Media Utilization instrument, specifically designed to measure digital media accessibility indicators, has good internal consistency and is reliable for assessing digital media accessibility.

Table 6. Reliability Test of the Digital Media Utilization Instrument

Cronbach's Alpha	Number of Items
0.796	4

Source: Data Analysis, 2025

The Disaster Knowledge Instrument is a multiple-choice test instrument consisting of 30 questions, covering six indicators of disaster knowledge: (1) understanding the definition of disaster, (2) knowing the types of disaster, (3) knowing the impact of disaster, (4) knowing digital disaster media, (5) knowing the benefits of disaster education, and (6) knowing disaster technology tools. Based on the Corrected Item–Total Correlation validity test results, most items show low or negative correlations, indicating that many do not meet the validity criteria.

Table 7. Validity Test of Disaster Knowledge Instrument

Item	Corrected Item–Total Correlation
B01	-0.046
B02	-0.112
B03	0.216
B04	-0.230
B05	-0.020
B06	0.016
B07	-0.100
B08	0.159
B09	-0.344
B10	0.137
B11	0.000
B12	-0.053
B13	0.000
B14	0.319
B15	-0.424
B16	0.146
B17	-0.347
B18	0.056
B19	-0.467
B20	-0.195
B21	-0.078
B22	0.086
B23	-0.215
B24	-0.001
B25	-0.380
B26	-0.013
B27	-0.049
B28	-0.133
B29	-0.147
B30	0.302

Source: Data Analysis, 2025

The reliability test yielded a Cronbach's Alpha value of -0.390, indicating that the Disaster Knowledge Instrument was unreliable. This negative value indicates inconsistencies between items, requiring revision or redevelopment before it can be used as a disaster knowledge measurement tool.

Table 8. Disaster Knowledge Instrument Reliability Test

Cronbach's Alpha	Number of Items
-0.390	30

Source: Data Analysis, 2025

C. Results and Discussion

1. Results

This research was conducted at SMP Negeri 1 Grogol Sukoharjo, an A-accredited school located in the East of Telukan Housing Complex, Grogol District, Sukoharjo Regency, at coordinates 7°37'22.6 "S and 110°49'38.6 "E. This school has a land area of 12,000 m², with 51 teachers and 964 students divided into 30 study groups from grades VII to IX. The facilities include classrooms, laboratories, libraries, sanitation facilities, and other supporting facilities. Geographically, SMP Negeri 1 Grogol Sukoharjo is located in a flood-prone area but also has good access to technology and digital media, making it a relevant research site for examining how digital media can enhance students' disaster knowledge.

a. Level of Digital Media Utilization by Students

The digital media use of students at SMP Negeri 1 Grogol Sukoharjo was analyzed using four primary indicators: frequency of digital media use, variety of digital platforms used, intensity of disaster information searches, and digital media accessibility. These four indicators were formulated to provide a comprehensive picture of how students utilize digital media in learning activities and in obtaining disaster information. Each indicator was measured through a questionnaire that generated an individual score, then classified into three categories: low, medium, and high, to determine the level of digital media utilization in a more targeted manner. This approach allows mapping of students' behavior regarding digital media use, both in general activities and in aspects directly related to disaster information.

Table 9. Distribution of Respondents by Digital Media Utilization Category

Category	Number of Students	Percentage
High	5	1.74%
Medium	176	61.11%
Low	107	37.15%

Source: Data Analysis, 2025

Table 1 shows that student digital media use is dominated by the moderate category, with 176 students (61.11%). Furthermore, 107 students (37.15%) fall into the low category, and only 5 students (1.74%) fall into the high category. This distribution indicates that the majority of students utilize digital media at a moderate level.

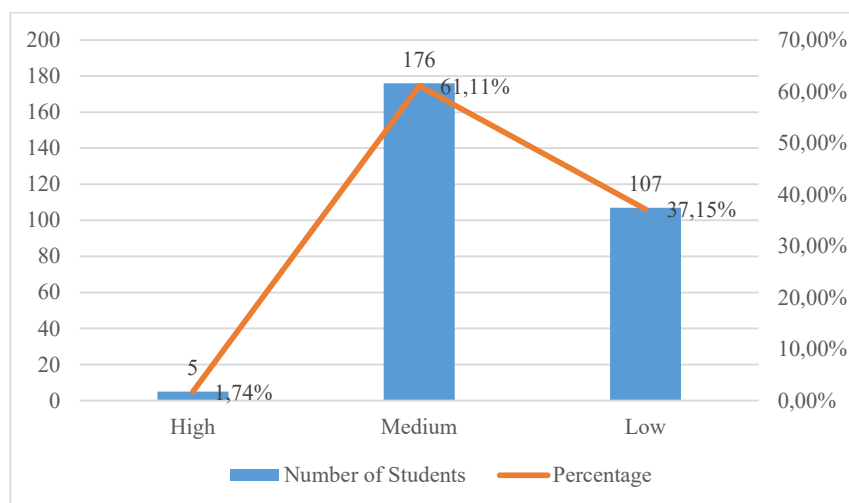


Figure 1. Distribution of Respondents by Media Utilization Category

The graph in Figure 1 clarifies this composition: the medium category has the most significant proportion, followed by the low category, while the high category accounts for only a small proportion of students. This pattern indicates that most students have used digital media with sufficient intensity but have not yet achieved optimal, consistent digital use in the context of learning or seeking disaster information.

Further analysis based on item classification shows that the highest percentage is in the disaster application utilization, at 83.85%. This finding indicates that students are familiar with and use official applications such as InfoBMKG, InaRISK, and Google Earth to obtain information regarding potential disasters in their area. Meanwhile, the lowest percentage is in the aspect of disaster information search intensity, at 78.25%. It indicates that some students do not routinely seek disaster information independently online or via social media. This difference indicates that

students are stronger in the accessibility of ready-to-use applications but are not yet fully active in exploring disaster information. These findings suggest that students' use of digital media has been quite successful overall, but there is still room for improvement in actively seeking disaster information. Therefore, the following analysis will examine how the level of digital media utilization impacts students' overall disaster knowledge.

b. Students' Disaster Knowledge Level

Disaster knowledge of students at SMP Negeri 1 Grogol Sukoharjo was measured based on six leading indicators, namely (1) understanding and identifying disasters, (2) knowing the types of disasters, (3) knowing the impacts of disasters, (4) knowing digital disaster media, (5) knowing the benefits of disaster education, and (6) knowing disaster technology tools. These six indicators were designed to comprehensively assess students' understanding, from basic concepts to the use of disaster technology in everyday life. The scores obtained by students through the questionnaire instrument were then classified into three categories: low, medium, and high to describe the level of disaster knowledge possessed by students.

Table 10. Distribution of Respondents by Disaster Knowledge Category

Category	Number of Students	Percentage
High	196	68.06%
Medium	86	29.86%
Low	6	2.08%

Source: Data Analysis, 2025

Based on Table 2, 196 students (68.06%) were in the high category. Furthermore, 86 students (29.86%) were in the medium category, and only 6 students (2.08%) were in the low category. These findings indicate that students' understanding of disasters is generally good, although a small number still require further strengthening.

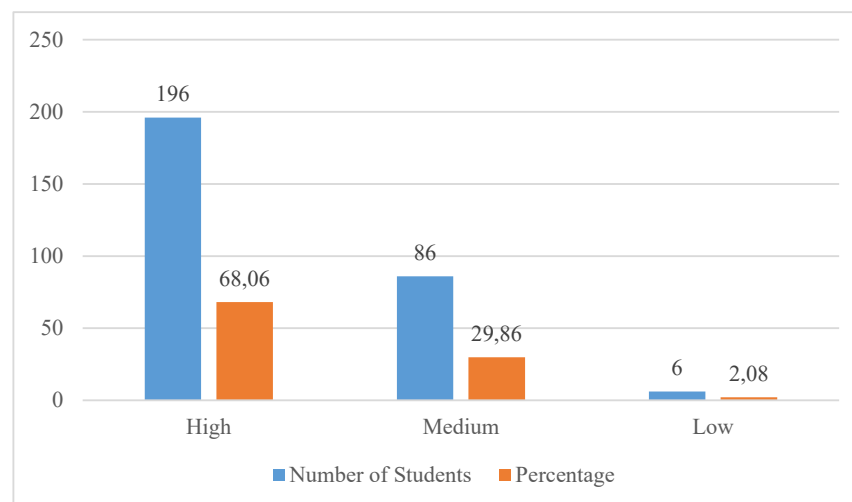


Figure 2. Distribution of Respondents by Disaster Knowledge Category

The graph in Figure 2 confirms this distribution, with the high category being the most dominant group, followed by the medium category, while the low category has a minimal share. It indicates that most students have a good understanding of disasters, including concepts, types, and impacts.

Table 11. Average Percentage of Each Disaster Knowledge Indicator

No	Indicator	Percentage (%)	Category
1.	Understanding and Identifying Disasters	83.85	High
2.	Understanding Types of Disasters	68.92	Medium
3.	Understanding the Impact of Disasters	86.11	High
4.	Understanding Digital Disaster Media	87.73	High
5.	Understanding the Benefits of Disaster Education	87.50	High
6.	Understanding Disaster Technology Tools	85.59	High

Source: Data Analysis, 2025

Analysis based on the average percentage of each indicator shows that students' understanding of disasters tends to be high in most aspects. The highest percentage is for knowing digital media for disasters (87.73%), followed by

knowing the benefits of disaster education (87.50%) and knowing the impact of disasters (86.11%). These three indicators indicate that students have a strong understanding of the use of technology, the benefits of disaster education, and the consequences of disasters. The indicator of knowledge of disaster technology tools is also in the high category, with a percentage of 85.59%, indicating that students have a sufficient understanding of the use of technological tools and devices for disaster monitoring and mitigation. The indicator of understanding and identifying disasters achieved 83.85%, indicating that students can recognize and explain disaster conditions effectively. Meanwhile, the lowest percentage is for knowledge of disaster types, at 68.92%, although it is still in the moderate category. This percentage indicates the need to strengthen education on various types of disasters, especially those that rarely occur in students' surroundings and may therefore be less remembered or less deeply understood.

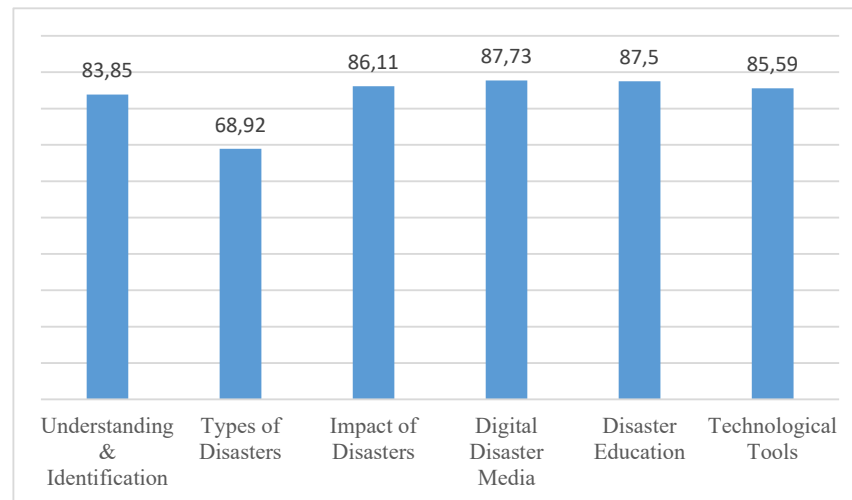


Figure 3. Average Percentage of Each Knowledge Indicator

The graph in Figure 3 clarifies the pattern of differences between indicators, with most indicators ranked high, while indicators for disaster types had lower percentages compared to the others. This visualization indicates a stronger understanding of students' understanding of technology, disaster media, impacts, and general disaster identification than of specific disaster types. Overall, students' disaster knowledge can be categorized as good, as indicated by the dominance of the high category and substantial percentages for most indicators. However, certain aspects, such as understanding of disaster types, still need improvement through more targeted disaster education. This finding provides an important basis for examining how students' disaster knowledge relates to their level of digital media utilization, which will be discussed in the next section.

c. The Influence of Digital Media Utilization on Disaster Knowledge

To determine the relationship between digital media use and students' disaster knowledge, this study used Spearman's rho. The Spearman test was chosen because the two variables' data are ordinal and not normally distributed, making nonparametric analysis more appropriate than parametric correlations such as Pearson's. Through this test, researchers can determine the direction and strength of the relationship between digital media utilization and disaster knowledge. Furthermore, this analysis tested the hypothesis that the greater students' digital media use, the higher their level of disaster knowledge. Therefore, Spearman's rho is an important tool for assessing the contribution of digital media to improving students' disaster literacy at SMP Negeri 1 Grogol Sukoharjo.

Table 12. Results of Spearman's rho Correlation Test

Spearman's rho		Utilizing Digital Media	Disaster Knowledge
Utilizing Digital Media	Correlation	1.000	.155**
	Coefficient	.	.008
	Sig. (2-tailed)	288	288
	N		
Disaster Knowledge	Correlation	.155**	1.000
	Coefficient	.008	.
	Sig. (2-tailed)	288	288
	N		

Source: Data Analysis, 2025

The Spearman's rho correlation test results show that the correlation coefficient obtained is $r = 0.155$ with a significance value of $p = 0.008$. A p-value of 0.05 or lower indicates a significant relationship between digital media use and students' disaster knowledge. A positive correlation coefficient indicates a unidirectional relationship: the greater the level of digital media use, the greater the students' disaster knowledge. However, the relationship, which falls into the weak category, indicates that the contribution of digital media to increased disaster knowledge is small, although it remains statistically significant. This finding is consistent with previous descriptive results: the majority of students' digital media use falls in the moderate category, while the high category dominates disaster knowledge. This condition indicates that digital media can serve as a source of information to improve students' understanding of disasters. However, other factors, such as learning at school, direct experience, and the social environment, also influence their knowledge levels. Thus, the research hypothesis that digital media use affects disaster knowledge is accepted.

2. Discussion

a. Level of Digital Media Utilization by Students

Based on the descriptive analysis, the average percentage of digital media utilization was 81.41% (high category). This finding indicates that the majority of students at SMP Negeri 1 Grogol Sukoharjo have utilized digital media both for learning needs and to obtain disaster information. The indicator with the highest percentage was the use of disaster applications (83.85%), indicating that students are familiar with and use official applications such as InfoBMKG, InaRISK, and Google Earth to understand potential disasters in their area. Meanwhile, the lowest percentage was the intensity of searching for disaster information (78.25%), indicating that some students have not actively sought out disaster information independently on the internet or social media.

This finding illustrates that students predominantly use digital media passively—receiving available information—rather than exploratively, such as searching, evaluating, and verifying disaster information. Nevertheless, the overall level of digital media use is high, indicating that students' digital literacy is well developed. The findings of this study align with those of (Rachmawan et al., 2025), who reported that the InaRISK Personal application improves students' flood preparedness by enhancing their understanding of risks and mitigation measures. Furthermore, (Kenedi et al., 2025) found that STEM-based digital learning models are effective in improving students' psychological preparedness and understanding of disaster risks. Overall, these results indicate that digital media, in the form of applications and online learning platforms, significantly contribute to students' development of disaster literacy. Interactive and easily accessible digital media have been shown to support the disaster learning process more effectively. A study in the Indonesian Journal on Learning and Advanced Education (IJOLAE) reported that higher levels of students' digital literacy significantly increased their engagement and interest in digital reading activities, indicating that frequent and varied use of digital media can meaningfully support learning (Frisco Harmadi et al., 2025).

b. Students' Disaster Knowledge Level

The descriptive analysis results showed that the average percentage of students' disaster knowledge was 83.67% (high category). This finding indicates that students have a good understanding of basic disaster concepts, types of disasters, impacts, mitigation, and the use of disaster technology. The indicators with the highest percentages were knowledge of digital disaster media (87.73%) and knowledge of the benefits of disaster education (87.50%). Meanwhile, the lowest percentage was for knowledge of disaster types (68.92%), indicating that some students still have difficulty distinguishing among disaster types, especially those that rarely occur in their environment.

This finding is consistent with research (Hayati et al., 2024), which found that students' disaster knowledge was in the high category and strongly correlated with preparedness ($r = 0.749$). In other words, good disaster knowledge is closely related to optimal preparedness skills. Research (Azhar et al., 2024) also shows that animated media can significantly improve preparedness knowledge, underscoring the crucial role of digital media in strengthening disaster literacy. Overall, these results indicate that students at SMP Negeri 1 Grogol Sukoharjo have a good understanding of disasters, particularly regarding technology, media, and the benefits of disaster education. However, their understanding of disaster types still needs improvement through contextual learning and real-life experience. (Wibowo et al., 2021) on building disaster-resilient communities through social capital in Klaten demonstrated that disaster knowledge is a crucial foundation for increasing community risk awareness and mitigation. This supports the belief that students' strong understanding of disasters can contribute to community-level preparedness. An evaluation of the Disaster Risk Reduction (DRR) program at SMP Negeri 1 Selo showed that school-based disaster education substantially improved the knowledge and skills of school members in facing disasters, even though changes in attitudes toward disasters were more limited (Khanif Nur et al., 2021).

c. The Influence of Digital Media Utilization on Disaster Knowledge

The Spearman's rho correlation test results showed a coefficient of $r = 0.155$ ($p = 0.008$), indicating a positive, significant relationship between digital media utilization and disaster knowledge, though weak. It indicates that the higher the students' level of digital media use, the greater their disaster knowledge, although this relationship remains limited. The use of digital media has been shown to provide easy access to disaster applications,

educational videos, visual materials, and interactive simulations that can strengthen student understanding. Digital media also enables self-directed learning, which helps students broaden their horizons beyond formal classroom learning. This finding is consistent with (Zou et al., 2022), who reported that online learning behavior significantly influenced improvements in students' disaster emergency knowledge.

Furthermore, (Mughtar & Puspita Dewi, 2024) showed that exposure to disaster information via digital media and direct experience influenced improvements in students' mitigation knowledge in eruption-prone areas. Thus, it can be concluded that although the relationship between digital media use and disaster knowledge is relatively weak, digital media still makes a significant contribution to strengthening students' disaster literacy. The integration of digital media into disaster education in schools should be continuously encouraged to optimize its use and enhance its educational impact. "Research published in Forum Geografi showed that simulation-based tsunami mitigation, supported by spatial modelling and digital mapping, helped communities better understand hazard zones and appropriate evacuation routes, illustrating how digital geospatial media can strengthen disaster-related knowledge (Tetuko et al., 2022).

D. Conclusion

The results of the study indicate that students' use of digital media at SMP Negeri 1 Grogol Sukoharjo falls in the moderate category, indicating that digital media has become part of students' daily activities but has not been fully utilized to obtain optimal disaster information. Meanwhile, students' level of disaster knowledge is in the high category, indicating that they have a good understanding of the basic concepts of disasters, their impacts, disaster technology, and the benefits of disaster education, although their understanding of disaster types still needs improvement. Furthermore, the correlation analysis shows a positive, significant relationship between digital media use and disaster knowledge, although the effect is relatively weak. These findings suggest that digital media plays a role in improving students' disaster knowledge, but it is not the only influencing factor. Other factors, such as formal learning at school, direct experience, and the social environment, also contribute to students' knowledge of disasters.

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