



Google Sites-Based Learning Media on Earthquake and Tsunami Disaster Mitigation: Students' Preparedness in Middle School

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ABSTRACT

Purpose – This study aims to develop a Google Sites-based disaster mitigation learning media to examine the preparedness of students toward earthquake and tsunami disasters at SMPN 1 Balaesang Tanjung.

Methodology – This study employed a Research and Development design using the ADDIE model, which includes the stages of analysis, design, development, implementation, and evaluation. The research involved a total sampling of 32 eighth-grade students at SMPN 1 Balaesang Tanjung. The intervention was carried out by developing a Google Sites-based learning media focused on disaster mitigation for earthquakes and tsunamis. Data were collected using Likert-scale questionnaires to assess three leading indicators: content quality, visual appearance, and benefits. The data were then analyzed using descriptive quantitative techniques to determine the effectiveness of the developed media.

Findings – The Google Sites-based learning media on earthquake and tsunami disaster mitigation developed in this study proved to be highly effective in supporting disaster mitigation education. It achieved an effectiveness score of 87.5% for content quality (very effective), 84.4% for visual appearance (effective), and 86% for benefits (very effective), with an overall average score of 86%, indicating a classification as very effective.

Contribution – This study presents an innovative web-based learning medium that integrates disaster mitigation content specifically designed for schools in high-risk areas, utilizing Google Sites for disaster preparedness.

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INTRODUCTION

Indonesia is one of the countries highly vulnerable to natural disasters, such as earthquakes and tsunamis, due to its location within the Pacific Ring of Fire, where three active tectonic plates — the Indo-Australian, Eurasian, and Pacific plates — converge. The movement of these plates triggers earthquakes with the potential to generate tsunamis, particularly in coastal areas.

Disaster education is an essential factor that will determine the level of community preparedness. It is especially relevant in a disaster-prone country like Indonesia, where the national curriculum has placed its mandate to empower disaster literacy at the primary and secondary levels. However, in practice, its implementation remains problematic, especially in finding learning media that involve active and contextual aspects according to the students' characteristics in the current digital era. The necessity of creating a web-based learning resource is imperative to ensure that disaster education is not only theoretical but also fosters behavioral and attitudinal change toward the risks.

Balaesang Tanjung Subdistrict is part of Donggala Regency and is located in a coastal area. According to the Disaster Vulnerability Profile of Donggala Regency, this region has a high risk of natural disasters due to its position within an active tectonic zone, particularly along the Palu-Koro Fault (Daly et al., 2016). According to the National Disaster Management Agency (BNPB), Donggala Regency has a Disaster Risk Index of 189, placing it in the high-risk category. The regency ranks 80th out of 496 regencies and cities in Indonesia in terms of disaster vulnerability (Daly et al., 2016). The high level of disaster risk in Balaesang Tanjung Subdistrict necessitates special attention in disaster mitigation planning and in enhancing community preparedness, including the preparedness of students as the younger generation. This priority age group requires special protection during emergencies, such as natural disasters.

Education is one of the most effective means to mitigate the risks of natural disasters (Hutagalung et al., 2022). Disaster mitigation education in schools is a strategic step to enhance students' preparedness and resilience. Through this education, students gain not only theoretical knowledge but also practical skills to handle emergencies. Early dissemination and practice of disaster mitigation in schools can reduce the likelihood of becoming victims when disasters occur (Handayani et al., 2024). Disaster mitigation and preparedness education for school-age children is crucial in equipping them to face disasters (UNICEF, 2021).

For student preparedness in the event of earthquake and tsunami disasters, the utilization of information technology in education is indispensable. One such platform you can use is Google Sites, where teachers can develop interactive, user-friendly learning materials. Google Sites enables the organization of instructional materials in a well-structured manner (Cahyo Nugroho & Hendrastomo, 2021). It includes information on the characteristics of earthquakes and tsunamis, as well as the mitigation measures that should be taken before, during, and after a disaster.

Video content, images, and infographics can also be embedded using Google Sites infrastructure to mitigate confusion during learning (Kamilah et al., 2023). Google Sites is a robust web-based application that teachers can utilize to create interactive, accessible, and collaborative learning environments. Screenshot Inspira provides a platform to embed text, images, videos, quizzes, and hyperlinks, which enables your students to recreate traditional pen-and-paper exams in a more engaging and richer learning experience. In the context of disaster education, this service supports the understanding of environmental threats, as well as simulation and planning for mitigation in collaboration. Such learning environments aim to promote independence in learning and encourage students to engage in activities that build their own knowledge about disasters (Fosnot, 2005).

In disaster prevention learning, visually output information helps to understand the evacuation procedure, early warning of earthquakes and tsunamis, and self-protection. Interactive and engaging multimedia content can make it easier for students to remember important information that could save their lives in emergencies.

Being a web-based platform, Google Sites also offers flexibility in learning, as it can be accessed anytime, anywhere. Students can engage in self-learning by browsing websites created by their teachers on computers,

tablets, or mobile phones (Kamilah et al., 2023). Additionally, features such as online quizzes and discussion forums will enable students to test their understanding while interacting with the teacher and classmates in discussions about disaster preparation strategies.

Another benefit is the possibility of updating information in real time (Jatilnur & Widyastuti, 2023). Google Sites-based educational materials can be modified by teachers as necessary to provide current information on disaster mitigation. This also means that students never receive outdated or irrelevant information, as disaster management technologies and safety guidelines are constantly evolving. Therefore, employing Google Sites in disaster mitigation education could be an effective means to promote readiness among students.

The constructivist model suggests that learners actively construct knowledge through their firsthand experiences and critical thinking in real-life situations. Experiential learning in disaster education has been shown to enhance conceptual understanding, critical analysis, and readiness to approach potential hazards (Mutasa & Coetzee, 2019). This is consistent with the principle of active learning, which supports cognitive and emotional involvement during the learning process (Bonwell & Eison, 1991). Incorporating these principles into digital tools, such as Google Sites, creates opportunities for genuine and meaningful learning, where students not only learn about preparedness but also practice and internalize disaster-related behaviors.

Practical disaster education activities encompass knowledge of hazards in a broader sense, and more broadly, they raise awareness, increase perception of disaster risk, and encourage appropriate responses to become habits (Kitagawa, 2021). Based on this premise, to encourage readiness, we made it the object of reflection and drew on experience with context, preparing disaster mitigation-based learning media using Google Sites. The purpose of this study is to strengthen the readiness level of theoretical knowledge and practical skills among middle school students and to support schools as hub centres for disaster-resilient education.

Although many studies have discussed disaster education in disaster-prone schools, a specific gap remains in the use of platforms such as Google Sites as learning media for disaster mitigation at the junior high school level. Previous studies have not specifically developed or tested Google Sites-based media for earthquake and tsunami topics that are contextual, interactive, and suited to the characteristics of coastal regions.

This study aims to analyze the effectiveness of using Google Sites-based learning media in improving students' preparedness for earthquake and tsunami disasters. By creating interactive, contextual, and easily accessible media, this research is expected to make a significant contribution to the evolution of disaster education in schools, particularly in junior high schools located in areas prone to disasters.

The novelty of this research lies in the contextual use of Google Sites in the coastal area of Balaesang Tanjung, which is highly vulnerable to earthquakes and tsunamis, as well as the implementation of interactive features that enable students to learn independently, reflectively, and applicatively based on real situations in their environment. Consequently, this research extends the academic conversation not only in the fields of educational technology and disaster education but also provides a feasible solution for teachers to incorporate disaster mitigation learning into technology-based classroom practices.

METHODOLOGY

Research Design

This study is a Research and Development (R&D) project that employs the ADDIE model, a systematic framework in instructional design comprising five main stages: Analysis, Design, Development, Implementation, and Evaluation (Spatioti et al., 2022). This model was chosen because it provides a systematic and structured approach to designing and developing instructional products that are effective and aligned with learners' needs.

The very first phase of the ADDIE framework is the analysis phase, which involves identifying the needs for creating a new product or model. This step involves identifying the problem, conducting a feasibility analysis, and evaluating existing products to determine their suitability. Then, the design stage focuses on product conceptual planning, which serves as the basis for the subsequent development process. The development phase involves creating the product until it is application- or trial-ready. It also includes preparing the instruments to measure the performance of the developed product.

After the product is ready, the implementation stage is the next step, which involves collecting user feedback after the product has been applied in the intended environment to assess its effectiveness and identify facilitators and barriers. The final stage, evaluation, involves assessing the success of the developed product or model by measuring the achievement of objectives and making revisions based on the feedback obtained. The ADDIE model is employed in a systematic and organized manner, with assessments conducted at each stage to ensure that the resulting product or model possesses a high level of validity and effectiveness (Waruwu, 2024).

The analysis stage was conducted to identify the level of preparedness of students at SMP Negeri 1 Balaesang Tanjung in facing earthquake and tsunami disasters, as well as the school's readiness in disaster mitigation, including the integration of disaster education into the curriculum and the availability of instructional media used in the learning process. The needs analysis aimed to determine the students' knowledge, attitudes, and initial skills related to disaster preparedness, as well as assess the school's readiness in terms of learning media and the inclusion of disaster-related materials in the curriculum. In addition, a feasibility analysis was carried out to assess the extent to which the development of the learning media product is suitable for implementation at the school, considering aspects such as the alignment of materials with students' characteristics and the current curriculum, the availability of supporting facilities and infrastructure, teachers' readiness to implement disaster education, and the potential sustainability and positive impact of the learning media in enhancing students' preparedness for disasters.

The Google Sites learning media design stage focused on developing the structure and layout to present materials on earthquake and tsunami mitigation. The media is an integration of visual elements such as pictures, simulation videos, evacuation maps, and online quizzes to enhance students' understanding and preparedness. Navigation and page design were made compatible with the learning characteristics of SMP Negeri 1 Balaesang Tanjung students, allowing them to learn independently or be guided by a teacher, and thus become actively engaged and gain a better understanding of the context of disaster-related concepts.

The development stage involved transforming the previously designed learning media into an educational website, utilizing Google Sites to make it functional and accessible. After the media product was developed, it underwent validation by experts, including material/content specialists and instructional media experts, to ensure the accuracy, relevance, and alignment of the content with instructional objectives. Additionally, the validation assessed the media's feasibility in terms of content, visual design, and technical aspects. The expert review was followed by a product revision incorporating expert feedback. The implementation stage, which included selecting the media to be used for disaster education and enhancing students' preparedness, then took place.

The implementation stage involved testing the validated Google Sites learning media in one class to assess its effectiveness before being applied across the entire research setting. During the implementation, students were given time to access the site, explore the content, engage in digital simulations, and complete the available quizzes related to earthquake and tsunami disaster mitigation. The outcomes of this stage served as the basis for evaluating and refining the learning media to ensure their optimal functionality and effectiveness before broader application in classroom learning.

The evaluation phase was used to confirm that the Google Sites learning media built was not only a technically quality and content-accurate product, but also that it made a real difference in increasing the students' disaster preparedness. The findings of this phase confirmed the effectiveness of the media. Therefore,

they constituted the basis for recommending its utilization as an alternative disaster education tool for schools in areas prone to disasters.

Participant

The population in this study refers to the individuals, objects, and subjects that possess the characteristics necessary for the research to be conducted (Amin et al., 2023). The population in this study consisted of the eighth-grade students at SMPN 1 Balaesang Tanjung, totaling 32 students. The sampling technique employed is total sampling, which indicates that the whole population served as the sample for this research (Amin et al., 2023), i.e., all members of the eighth-grade population.

According to Jean Piaget's theory of cognitive development, eighth-grade students, whose ages range from 12 to 15 years, are in the formal operational stage, characterized by the ability to think abstractly, logically, and systematically (Santrock, 2019). In addition, at this stage, students' affective development also reaches maturity, encompassing changes in attitudes, values, and emotions. The students served as test subjects to determine the effectiveness of the developed instructional media (Fahruji et al., 2022)

Data Collection

This study employed a data collection technique using a Likert-scale questionnaire administered to 32 eighth-grade students at SMPN 1 Balaesang Tanjung. The questionnaire was designed to measure three leading indicators: content quality, visual appearance, and the benefits of the learning media. This technique was chosen because it is effective for gathering quantitative data related to students' perceptions and evaluations of the developed media in a systematic and easily analyzable manner.

Instrument

The research instrument implemented consisted of a series of statements on a 4-point Likert scale presented to students to record their ideas concerning the effectiveness of the mediator developed. Every statement in the questionnaire used a 4-point scale, designed to gather quantitative data that could be analyzed descriptively. The instrument used in this study was a questionnaire that was first validated by experts and then tested for validity and reliability using statistical analysis. The feasibility assessment of the instrument employed a Likert-scale validation sheet. The earthquake and tsunami preparedness questionnaire consisted of 50 items representing five indicators of preparedness. The validity test results showed that 45 items were valid, while five items were invalid. The 45 valid items were then tested for reliability, and the results are presented in Table 1. This instrument was developed independently by the researcher based on indicators of learning media effectiveness.

Table 1. Results of Instrument Reliability Test

Reliability Statistics
Cronbach's Alpha: 0.952 N of Items: 45

Data Analysis

The data from the media of learning to the local trial, involving 32 eighth-grade students from SMPN 1 Balaesang Tanjung, were analyzed using descriptive quantitative techniques. This method is used to systematically present, detail, and summarize the numerical data without making generalized or inferential conclusions (Aziza, 2023). The effectiveness of the media was assessed through a student response questionnaire that included several indicators, such as content, visual appearance, and benefits (Salsabila & Aslam, 2022). Each indicator in the questionnaire was measured using a 4-point Likert scale consisting of strongly agree, agree, disagree, and strongly disagree (Ningtiyas et al., 2021). Data analysis was carried out by calculating the percentage of the total scores obtained in order to determine the effectiveness category of the developed media, using the following formula

$$NP = \frac{R}{SM} \times 100 \%$$

Description:

NP = Percentage value sought or expected

R = Raw score obtained

SM = Maximum score

The interpretation of questionnaire scores can be classified into several specific categories to facilitate the analysis of the effectiveness of the learning media. The effectiveness assessment criteria, as presented by Ferdinand (2014) in the study "Effectiveness of Online Learning Using WhatsApp Group Media from the Perspective of Students' Parents" (Oktariato & Yatri, 2023), are outlined in Table 1 below.

Table 2. Criteria for Media Effectiveness Based on Questionnaire Results

Score Interval (P Value (%))	Category
85% < P ≤ 100%	Very Effective
70% < P ≤ 85%	Effective
55% < P ≤ 70%	Moderately Effective
40% < P ≤ 55%	Less Effective
P ≤ 40%	Very Ineffective

FINDINGS

Before evaluating the effectiveness of the learning media, the development of this Google Sites-based learning media first followed the systematic stages of the ADDIE development model. The primary purpose of the analysis stage was to determine the requirements, existing situations, and the feasibility of creating educational media for disaster learning at SMP Negeri 1 Balaesang Tanjung. The aspects analyzed were the needs of the students, the condition of the school, and the feasibility of the media development. Based on interviews with teachers and the principal, it was found that the school requires engaging and contextual learning media for disaster mitigation education, particularly on earthquakes and tsunamis, due to its location in a coastal area along an active fault line that is highly vulnerable to disasters. The principal emphasized that disaster education should be adapted to the local context and provide students with a clear understanding of the risks surrounding them. Interviews with students revealed that they possess only general knowledge about disasters, lacking a proper understanding of mitigation steps, while expressing interest in interactive learning media that can present the material more engagingly visually. These findings indicate the need for digital learning media that is engaging, contextually relevant, and aligned with the characteristics of coastal regions prone to disasters.

The design stage involved creating the concept and structure of the Google Sites-based learning media based on the analysis results. The media contained materials on earthquake and tsunami disaster mitigation, organized systematically to be easily understood by students at SMP Negeri 1 Balaesang Tanjung. The Google Sites structure consisted of several main pages, including Home, Learning Materials (covering general disaster concepts, earthquakes, and tsunamis), Disaster Mitigation, Videos, and Quizzes. To facilitate the development stage, the design was outlined in a storyboard that visually mapped the page flow, content, multimedia elements, and expected interactivity, ensuring that each component aligned with the learning objectives.

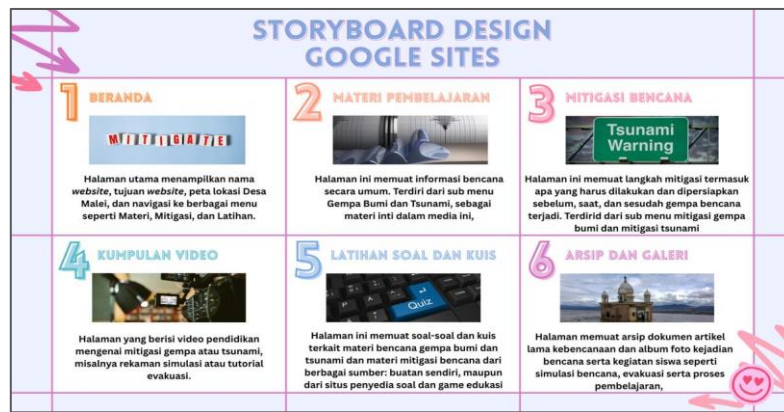


Figure 1. Storyboard Design for the Development of Google Sites-Based Learning Media

The development stage began with assigning an identity to the learning media, named SAFE, which stands for Students Aware for Emergencies. The term *safe* was chosen for its meaning, "secure" or "protected," reflecting the primary goal of the media—to foster a sense of safety by improving students' preparedness for earthquake and tsunami disasters. The acronym also represents the vision of the learning media to build students who are resilient, ready, and aware of potential emergencies.

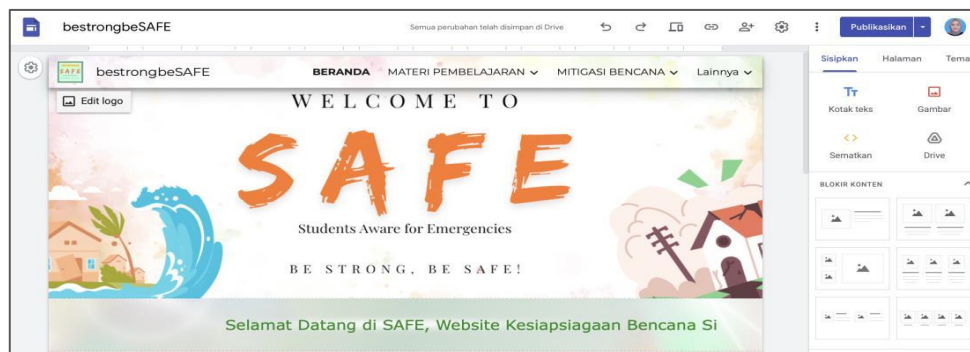


Figure 2. Header Display on the Homepage

The implementation stage involved applying the validated Google Sites-based learning media in Class VIII A through Social Studies lessons under the subtheme 'Geographical Conditions of Indonesia,' specifically the topic 'Natural Disasters and Their Mitigation Measures.' During this stage, students accessed the SAFE website, explored the learning materials, observed illustrations and simulation videos, and completed interactive quizzes integrated into the media. This process aimed to evaluate the practicality and effectiveness of the learning media in improving students' understanding and preparedness for earthquake and tsunami disasters.



Figure 3. Students are learning by accessing SAFE

This study aimed to determine the effectiveness of the developed Google Sites-based learning media in mitigating earthquake and tsunami disasters through a trial involving 32 eighth-grade students at SMPN 1 Balaesang Tanjung. The assessment was conducted using a 4-point Likert scale questionnaire covering three key indicators: content quality, visual appearance, and benefits.

The evaluation stage not only included appreciation for the content and visual design but also incorporated technical feedback from the teacher regarding the distribution and accessibility of the media. One central idea was to make the link shorter or to include a QR (Quick Response) code, allowing a student to easily access the SAFE site, especially if they were using a personal device in a location with poor internet connection. The teacher wrote that if this feature were added, the media would be more comfortable for use in both face-to-face and online learning, and it would also not be limited to the classroom in terms of usability.

The SAFE Google Sites-based learning media underwent a validity test conducted by three experts: an instructional media expert, a content expert, and a learning practitioner. An instructional media expert estimated the feasibility of educational media at 96.7%, a content expert at 95%, and a learning practitioner at 91.1%, all of which fall into the 'very feasible' category. The findings demonstrate that the SAFE media is a valid, well-designed, and effective learning tool for disaster education.

After undergoing the development and validation processes, the learning media were then tested to evaluate their effectiveness for each indicator. The content indicator assessed the quality of the learning material within the media, including its accuracy, completeness, relevance, and alignment with the context of earthquake and tsunami disaster mitigation. The assessment results for the content indicator are presented in Table 3 below.

Table 3. Recapitulation of Assessment Results for the Content Indicator

Number of Respondents	Number of Statements	Maximum Score	Obtained Score	Percentage	Category
32 Students	10	1280	1120	87.5%	Very Effective

Table 3 presents the recapitulation of assessment results for the content indicator. Based on responses from 32 students to 10 statements, the maximum possible score was 1,280, and the obtained score was 1,120, resulting in a percentage of 87.5%, which falls into the "Very Effective" category.

The visual appearance indicator assessed the aesthetics, readability, layout consistency, and ease of navigation between pages on the developed Google Sites. The assessment results for the visual appearance indicator are presented in Table 4 below.

Table 4. Recapitulation of Assessment Results for the Visual Appearance Indicator

Number of Respondents	Number of Statements	Maximum Score	Obtained Score	Percentage	Category
32 Students	10	1280	1080	84.5%	Effective

Table 4 presents the recapitulation of assessment results for the visual appearance indicator. Based on responses from 32 students to 10 statements, the maximum possible score was 1,280, while the obtained score reached 1,080, resulting in a percentage of 84.5%, categorized as Effective.

The benefits indicator measured the extent to which the media assisted students in understanding the material, facilitated independent learning, and improved disaster preparedness. The assessment results for the benefits indicator are presented in Table 5 below.

Table 5. Recapitulation of Assessment Results for the Benefits Indicator

Number of Respondents	Number of Statements	Maximum Score	Obtained Score	Percentage	Category
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32 Students	10	1280	1101	86%	Very Effective
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Table 5 presents the recapitulation of assessment results for the benefits indicator. Based on responses from 32 students to 10 statements, the maximum possible score was 1,280, and the obtained score was 1,101, resulting in a percentage of 86%, categorized as Very Effective. This indicates that the majority of students found the media to be very helpful in learning the preparedness steps for dealing with earthquakes and tsunamis.

DISCUSSION

The development of the media in this study followed the ADDIE model, which was adapted to the context of disaster mitigation and management. The first stage, analysis, began with identifying the needs and problems faced by students in disaster-prone areas such as Balaesang Tanjung Subdistrict. This study encompassed a review of the curriculum and disaster-related literature, as well as an assessment of students' preparedness for potential earthquakes and tsunamis. Education regarding disasters is vital because it can raise awareness among students, and consequently, the number of victims is likely to be reduced (Handayani et al., 2024).

During the design phase, the website's content was planned, educational resources were prepared, visual materials were selected, and assessment instruments were developed. The Google Sites pages were designed to present the content logically, starting with the basics of earthquakes and tsunamis, followed by the steps of mitigation, and concluding with interactive practice questions (Kamilah et al., 2023). The material was developed to be realistic and to help students visualize evacuation procedures, which are crucial in disaster mitigation education (Jatilinar & Widyastuti, 2023).

The development phase is when the design is actually turned into a tangible product. The resources were uploaded to Google Sites, accompanied by various multimedia components, including pictures, instructional videos, and quizzes created using Google Forms. This operation ensured that the media were not only informative but also interesting and user-friendly (Kamilah et al., 2023).

The completed media was then tested during the implementation stage with 32 eighth-grade students at SMPN 1 Balaesang Tanjung. The students were asked to independently access the media, study the material, and complete the evaluation exercises. The results of the students' interaction with the media were then analyzed to determine their responses and the level of effectiveness (Fahruji et al., 2022).

Finally, in the evaluation stage, both formative and summative evaluations were conducted to identify the strengths and weaknesses of the developed learning media. This evaluation was conducted using questionnaires that assessed aspects of content quality, visual appeal, and the benefits of the media in disaster mitigation learning (Salsabila & Aslam, 2022). This evaluation is essential to ensure that the developed media meets the feasibility criteria in both substance and technical aspects (Optiana & Mukhlis, n.d.).

Subsequently, the effectiveness of the developed learning media was analyzed based on the questionnaire responses completed by 32 eighth-grade students at SMPN 1 Balaesang Tanjung. The assessment employed a 4-point Likert scale and covered three leading indicators: content, visual appearance, and benefits. This analysis aimed to evaluate the extent to which the Google Sites-based media supported thematic learning on earthquake and tsunami disaster mitigation.

The content indicator measured the quality of the instructional material within the media, particularly in terms of accuracy, appropriateness, relevance, and strengths related to the topic of earthquake and tsunami disaster mitigation. The assessment results showed a total score of 1120 out of a maximum score of 1280, yielding a percentage of 87.5%, which is categorized as Very Effective.

These results indicate that students perceived the material as highly relevant and easy to understand, covering accurate and informative mitigation steps. The content included the causes of earthquakes, indicators of impending tsunamis, as well as systematic and visual evacuation procedures, complemented by infographics and simulation videos. The quality of e-learning content significantly contributes to the overall

learning experience, and the quality of the material is directly proportional to students' levels of satisfaction (Kumar et al., 2021).

In addition to content, another aspect that determines the success of digital learning media is its visual appearance. Therefore, the next indicator analyzed was the visual aspect of the media, which included elements of aesthetics, readability, and ease of navigation within the developed Google Sites.

The visual appearance indicator was used to assess the visual aspects and interface design of the learning media, including text readability, color selection, layout consistency, and ease of navigation between pages. In this study, the visual indicator consisted of 10 statements answered by 32 students using a 1–4 Likert scale. The assessment results showed an obtained score of 1,080 out of a maximum score of 1280, yielding a percentage of 84.4%, which falls into the Effective category.

These results indicate that most students found the media's appearance to be pretty attractive, clear, and comfortable to use. However, there is still room for improvement to optimize its aesthetics and functionality. A well-designed media serves as a crucial support in delivering visual messages, especially in contextual learning such as disaster mitigation, where students need clear visual guides on safety procedures, evacuation routes, and warning symbols.

Accuracy, visualization, and content aesthetics are the main factors that determine the quality and user satisfaction of online learning materials (Kumar et al., 2021). Visual elements, such as graphics, layout, and logical color schemes, significantly improve user retention and learning effectiveness (Alshaykha, 2022). With Google Sites, the look of the media can be made responsive and comfortable for a variety of devices, such as smartphones and laptops. At the same time, infographics, educational videos, and quizzes can be integrated to enhance the learning process. This, therefore, is a great benefit, in particular, for disaster mitigation subjects such as earthquakes and tsunamis, which are heavily reliant on procedural illustrations and the use of clear visual markers.

The subsequent examination of the topic of media as a learning tool, after considering its visual appeal, also involved assessing its benefits. This indicator characterizes the level at which the media becomes a source of the students' learning processes and outcomes.

The benefits indicator was used to assess the extent to which the learning media helped students understand the material, engage in independent learning, and enhance their preparedness for earthquakes and tsunamis. In this indicator, students evaluated the usefulness of Google Sites in supporting learning activities, clarifying concepts, and facilitating flexible access to learning. Based on the assessment results, a score of 1101 out of a maximum of 1280 was obtained, yielding a percentage of 86%, which is categorized as Very Effective.

These results indicate that the majority of students considered the media to be highly beneficial, both in terms of content and the learning experience provided. This media provides access to information that can be revisited at any time, enabling students to learn independently without always relying on the teacher, and presents material that is practical and easily related to real-life situations in their disaster-prone residential areas.

For the overall results regarding the effectiveness of the developed learning media, the assessment scores from the three indicators were compiled and averaged. This summary is presented in Table 5 below to show the overall level of media effectiveness.

Table 5. Criteria for Media Effectiveness Based on Questionnaire Results

Indicator	Obtained Score	Percentage	Category
Content	1120	87.5%	Very Effective
Visual Appearance	1080	84.4%	Effective
Benefits	1101	86%	Very Effective
Average	1100	86%	Very Effective

Based on the recapitulation of the three indicators, an average score of 1100 out of 1280 was achieved, corresponding to an average percentage of 86%. This falls into the Very Effective category, indicating that overall, the Google Sites-based learning media on earthquake and tsunami disaster mitigation was considered highly appropriate and successfully met the learning objectives according to students' perceptions. These results reflect that the media is not only strong in terms of content but also beneficial and easy to use in supporting students' understanding and preparedness for earthquake and tsunami disasters.

The findings indicate that the effectiveness of the Google Sites (SAFE) learning media is not only derived from its informative content but also from its pedagogical mechanisms supported by interactivity and visualization features. According to the theory of technology-enhanced learning (Laurillard, 2012), interactive digital environments can enhance student engagement and promote self-directed learning, as learners can control their learning pace and explore materials according to their individual needs. In the context of disaster education, this aligns with Shaw et al. (2014), who assert that experiential and visually supported learning helps students understand risks and mitigation steps more contextually. Through visual features such as images, simulation videos, and evacuation maps, along with interactive quizzes, Google Sites encourages students to construct knowledge and develop preparedness skills actively. Thus, its effectiveness in enhancing awareness and readiness toward disasters can be pedagogically and theoretically explained.

CONCLUSION

This study developed Google Sites-based learning media specifically designed to improve students' preparedness for earthquake and tsunami disasters. The development employed the ADDIE model, which involves systematic stages ranging from needs analysis to evaluating the effectiveness of the media. Based on the trial conducted with 32 eighth-grade students at SMPN 1 Balaesang Tanjung, the media was assessed through three leading indicators: content, visual design, and usefulness. The survey results showed that the content received an effectiveness score of 87.5% (very effective), the visual design 84.4% (effective), and the usefulness 86% (very effective). Overall, the learning media has an average effectiveness percentage of 86%, which is classified as effective. The learning media that have been developed are not only informative and contextual but also interactive and easily accessible, making them suitable as an alternative learning resource for disaster education in schools. It has been proven that it can enhance students' knowledge and readiness for potential natural disasters, especially earthquakes and tsunamis, in a vulnerable area like Balaesang Tanjung.

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