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Forest and Land Fire Disaster Learning Assisted by Google Sites for Disaster Literacy of Students Senior High School in Tebo Regency

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Abstract

Forest and land fires are a frequent disaster in Indonesia and cause multidimensional impacts, ranging from environmental damage and health problems to disruptions to education. In areas prone to forest and land fires, such as Tebo Regency, Jambi Province, recurring haze events indicate that mitigation efforts have not been fully balanced by increased disaster literacy, especially among students. This condition also shows that disaster learning in schools still needs to be strengthened through the use of learning media that is contextual and relevant to local conditions, including the use of digital media. This study aims to describe the implementation of forest and land fire mitigation learning using Google Sites and to evaluate students' disaster literacy levels after participating in the learning. The study used a quantitative approach with a pre-experimental design in the form of a one-shot case study. The research sample consisted of 27 11th-grade students of SMA11 Tebo Regency, selected through purposive sampling. Data collection techniques included observation of learning implementation, tests to measure basic disaster literacy and functional disaster literacy, and questionnaires to measure communicative literacy and critical disaster literacy. Data analysis was conducted using descriptive quantitative methods. The results of the study indicate that forest and land fire mitigation learning assisted by Google Sites can be implemented effectively and received a positive response from students. The level of student disaster literacy is in the high category across all indicators, with the majority of students able to understand the basic concepts of forest and land fires, apply mitigation information, communicate disaster messages, and demonstrate critical thinking skills on forest and land fire issues. These findings indicate that the use of Google Sites as a contextual learning medium has the potential to comprehensively improve student disaster literacy and support the strengthening of disaster preparedness in forest and land fire-prone areas.

Keywords: Forest and Land Fire Disaster Learning, Google Sites, Disaster Literacy

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1. Introduction

Indonesia is a country with a high level of disaster vulnerability due to its geographical location on the Pacific Ring of Fire and its tropical climate which supports the occurrence of various natural disasters, including forest and land fires (Kaban et al., 2019). According to data from the National Disaster Management Agency (BNPB), more than 5,400 disasters occurred in Indonesia throughout 2023, 2,105 of which were forest and land fires.(BNPB, 2023)The high frequency of these incidents confirms that forest and land fires have become a recurring disaster with widespread impacts and require systematic management. Forest and land fires have multidimensional impacts, including ecosystem damage, increased carbon emissions, economic losses, and public health problems due to smoke exposure (Arshad et al., 2022; Damayanti et al., 2024). Ministry of Environment and Forestry (KLHK) recorded 1,649,258 hectares of land burned in Indonesia in 2019, and in 2015 carbon emissions from forest and land fires reached 1.75 billion tons, exceeding the weekly emissions of the entire US economy (Normile, 2019). The Sumatra and Kalimantan regions, including Jambi Province, are the epicenter of forest and land fires, with the primary causes being human activities such as land clearing using fire, forest encroachment, weak monitoring, and law enforcement (Thoha et al., 2023). This situation is exacerbated by low mitigation education and uncontrolled land use(Khairunnisa & Rosalena, 2019).

Forest and land fires are categorized as disasters because of their broad and complex impacts, even though most incidents are triggered by anthropogenic factors (Siregar et al., 2021). By recognizing forest and land fires as a disaster, their management involves early warning systems, strengthening community capacity, and integrating mitigation materials into the education curriculum (Nawira et al., 2023). This determination does not remove the perpetrator's responsibility, but emphasizes the need for adaptive and collaborative policies in handling forest and land fires (Rozikin et al., 2023). This paradigm is important to strengthen the country's preparedness to face recurring forest and land fires as an annual threat (Ruswandi et al., 2021). However, despite the implementation of various policies and management frameworks, the impact of forest and land fires on the ground is still widely felt by various sectors of society.

The impact of forest and land fires is clearly visible in various aspects, particularly in the economic and education sectors. Economically, forest and land fires cause trillions of rupiah in losses, including damage to natural resources, reduced productivity, and disruption to social activities (Ahsan et al., 2022). The impact on education is that schools are closed and the teaching and learning process is disrupted due to very poor air quality, as happened in Jambi and Riau, which triggered learning loss (Koesbardiati et al., 2023). Around 80% of fires are caused by human activities, especially illegal clearing of agricultural and plantation land *(*Tan *et al*., 2020). This phenomenon is exacerbated by weak law enforcement, thus increasing the chances of repeated fires (Riyanto et al., 2020; Silitonga & Zaharah, 2023).

This issue becomes even more relevant when considering the conditions of vulnerable areas like Tebo Regency, Jambi Province, which is highly vulnerable to forest and land fires. Geographically, Tebo has peatlands and scrubland that are highly susceptible to fire during the dry season. Ministry of Environment and Forestry While the Tebo Regional Disaster Management Agency (BPBD) recorded more than 340 hotspots in 2019, the Tebo Regional Disaster Management Agency (BPBD) reported 950 hectares of land burned with 579 hotspots throughout 2023. Most of the fires stem from land clearing practices by communities and companies that do not fully understand the risks and long-term impacts of such activities. While the local government has implemented various preventative measures, such as establishing a Fire Awareness Community (MPA) and providing a forest and land fire alert post, the rate of forest fires in this area remains high.

Forest and land fires have a direct impact on the continuity of learning, particularly in Tebo Regency, Jambi Province. The haze incident in 2023 led to an increase in cases of respiratory

infections (ARI) and temporary school closures, disrupting the teaching and learning process (Dinkes, 2023; Disdikbud Tebo, 2023). This situation demonstrates that forest and land fires are not only an environmental issue, but also an educational issue that impacts the quality of human resources. Preventing forest and land fires requires behavioral changes fostered through education, particularly to foster awareness and preparedness in the younger generation (Wang et al., 2023). However, the level of disaster literacy among students in Indonesia is still relatively low, especially in the aspects of mitigation and preparedness (Tahmidaten & Krismanto, 2019). In fact, the younger generation has a strategic role as agents of change in building a culture of disaster awareness in society (Imardiani et al., 2023).

The urgency of disaster issues in Indonesia encourages the integration of disaster mitigation into school learning (Suharini et al., 2020). According to BNPB (2023) integrating disaster education into schools is a key pillar in building a disaster-resilient community. Schools play a strategic role in instilling disaster mitigation knowledge from an early age (Mulianingsih & Hardati, 2022). Integrating disaster mitigation into school learning is important, but its implementation still faces obstacles such as limited teaching media and low utilization of contextual learning technology (Noviana et al., 2023; Prayoga, 2024).

Low literacy regarding forest and land fire disasters can be overcome by developing teaching materials that utilize technological advances (Maulana et al., 2024). Media technology plays an important role as an intermediary in the learning process, and has been proven to increase students' interest in learning (Putri et al., 2024)**.** One potential medium for forest and land fire mitigation learning is Google Sites. The use of digital media like Google Sites is considered effective in increasing student understanding and engagement in disaster mitigation learning. Previous research has shown that the use of technology-based media, including Google Sites, can improve students' critical and creative thinking skills, as well as their understanding of disaster issues (Cisnaulin et al., 2025; Roslan et al., 2024; Yustina & Kapsin, 2017). Most previous research still focuses on print media such as booklets (Triana et al., 2023), e-magazine (Arfianti, 2021), or digital comics (Amin & Bahri, 2024), has not integrated simple and collaborative digital platforms like Google Sites in the context of forest and land fires. This indicates a research gap in developing digital, contextual, and local-relevant learning media for forest and land fire mitigation for high school students in disaster-prone areas.

This research offers an innovative solution in the form of developing a Google Sites-based forest and land fire mitigation learning model designed for high school students in Tebo Regency, especially at SMA 11 because the research location is close to the history of fire points (hotspots). This media is considered effective in increasing student learning motivation and academic achievement (Naibaho, 2024). Based on the description, this research is important to develop a contextual and adaptive model of forest and land fire mitigation learning. The purpose of this study is to describe the implementation of forest and land fire mitigation learning assisted by Google sites media in the learning process at SMA 11 Tebo Regency and evaluate the level of disaster literacy after participating in the implementation of forest and land fire mitigation learning assisted by Google sites. Through Google sites media, this research is expected to provide a real contribution in strengthening disaster literacy and building student resilience from an early age in vulnerable areas such as Tebo Regency through an educational and technology-based approach.

2. Method

This study uses a quantitative approach. The research design used in this study is a pre-experimental study with a one-shot case study. In this design, a group of research subjects are given a treatment and then assessed afterward. The use of this design was carried out to analyze forest and land fire mitigation learning assisted by Google Sites media to improve disaster literacy. The population in this study were all grade XI students of SMA 11 Tebo Regency in the

2025/2026 academic year. Grade XI was chosen because at that level there is material taught. The details of the number of students in each class are presented in Table 1.

Table 1. Population

School	Class	Number of Students
SMA 11, Tebo Regency	XI A	30
	XI B	31
	XI C	32
	XI D	27
	XI E	30
Total		150

This research sample uses a nonprobability sampling type with a purposive sampling technique, in SMAN 11 Tebo Regency there are six class XI, but only class XI D has a Geography interest so it was selected as a research sample with a total of 27 students. Data collection techniques use observation, tests, and questionnaires. The research instrument was first tested for its suitability through validity and reliability tests. The results of the validity test produced 25 test questions, 26 questionnaire questions that were valid and used in the research. The reliability of the instrument is very high with a Cronbach Alpha value of 0.896 on the test and 0.925 on the questionnaire so that both are declared reliable. The test was used to evaluate students' disaster literacy in the basic and functional dimensions, tailored to the forest and land fire mitigation material. The test was administered after the implementation of forest and land fire learning, with multiple-choice questions. The questionnaire, which measured students' disaster literacy, had a graded answer scale of 4 points for complete answers and 1 point for incomplete answers. The data analysis technique used is quantitative descriptive analysis to describe students' disaster literacy based on disaster literacy indicators according to Brown*et al*., (2014) and implementation of learning that refers to the Permendikbudristek Nomor 16 Tahun 2022. To clarify the direction and focus of the research, the following is Table 2, the operational definition of the variables which contains the research variables along with their indicators and data collection techniques.

Table 2. Operational Definitions of Variables

Variables	Indicator	Data Collector	Number of Questions
Learning Implementation	1. Learning planning 2. Implementation of learning 3. Assessment of the learning process.	1. Observation 2. Questionnaire 3. Documentation Study	14 17
Disaster Literacy	1. *basic disaster literacy* 2. *functional disaster literacy*	Test.	25
	1. communicative literacy, *2. critical disaster literacy.*	Questionnaire	26

3. Results and Discussion

A. Result

Google Sites is a web-based platform developed by Google to make it easy for users to create websites for free without requiring programming skills. In an educational context, Google Sites functions as a web-based learning medium that can facilitate the presentation of materials,

interactive assignments, collaboration, and the integration of various multimedia content such as text, images, and videos in a structured learning environment. Its ease of access and use make Google Sites one of the learning media that supports the implementation of technology-based learning, both in distance learning and face-to-face (Djoko *et al*., 2024).

The Google Sites media used can be seen in Figure 1, which displays the structure of the learning media page with several main menus, namely materials, videos, quizzes, vulnerability information, assignments, and suggestions. This page structure is designed to make it easier for students to navigate all learning content on forest and land fires systematically in one learning website. The unique characteristic of Google Sites media in this study lies in its ability to integrate various forms of learning content such as text materials, images, videos, and evaluation activities into a single digital platform that is structured and easily accessible through various devices. In addition, this media allows students to study the material independently through a clear learning flow because each menu is arranged sequentially according to the learning stages.

Figure 1. Google Sites learning media page structure
Source: Research Document, 2025

The media components that play a role in improving students' disaster literacy are found in the materials, videos, quizzes, vulnerability information, and assignments menus. The materials menu systematically presents basic concepts of forest and land fires through digital books, helping students understand the concepts, causes, impacts, and mitigation efforts of forest and land fires. The videos menu provides a picture of real-world conditions in the field, allowing students to understand the phenomenon of forest and land fires more contextually. The quiz menu serves as a self-evaluation tool to measure students' understanding of the material they have learned. Meanwhile, the vulnerability information menu helps students relate the material to the vulnerability conditions of their surrounding areas, and the assignment menu encourages students to design forest and land fire mitigation solutions through group poster creation. Thus, these sections not only present information but also encourage students to understand disaster concepts, relate information to real-world conditions, and actively analyze and design mitigation solutions, making learning more contextual and meaningful.

1) Implementation of Forest and Land Fire Disaster Learning Assisted by Google Sites Media for Students of SMA 11 Tebo Regency

Forest and land fire disaster learning was conducted in two learning sessions, with each session allocated 3 x 45 minutes, or 135 minutes. This study used as the research object SMA 11 in Tebo Regency. The implementation of forest and land fire disaster learning using Google Sites media was carried out as an effort to utilize digital media to support the learning process. Google Sites media was used as a learning supplement to enrich learning resources and strengthen students' understanding of forest and land fire mitigation material. The implementation of learning refers to the educational process standards as stipulated in Permendikbudristek Number 16 of 2022,

which includes the planning, implementation, and assessment stages of learning.

a) Planning

In the lesson planning stage, teachers formulate learning objectives that emphasize students' ability to understand and analyze forest and land fire disasters, including the types of forest and land fires, causes, impacts, and mitigation efforts. These learning objectives are formulated to encourage the achievement of students' cognitive, skill, and attitude aspects. These learning objectives then serve as a reference in determining learning strategies, utilizing Google Sites media, and designing learning activities to be implemented. With systematic planning, the learning process is expected to proceed in a focused and meaningful manner.

The established learning objectives serve as the basis for selecting and utilizing Google Sites-based digital learning media. This previously developed Google Sites-based digital learning media is designated as a learning supplement. Teachers plan to utilize this media to support material delivery, reinforce concepts, and facilitate student independent learning. The media does not serve as the sole learning resource; instead, it is combined with teacher explanations and discussion activities to ensure the learning process remains focused and interactive.

The forest and land fire disaster learning plan was designed using a Problem-Based Learning model that places contextual problems as the starting point of the learning process. This model was chosen because it aligns with the characteristics of forest and land fire material that requires analytical skills, problem-solving, and rational decision-making. The Problem-Based Learning syntax, which includes problem orientation, student organization, investigation, development and presentation of results, and reflection, served as a framework for developing Google Sites-assisted learning activities. This planning aims to ensure that the use of Google Sites not only functions as a material provider but also supports the implementation of each learning stage systematically and meaningfully.

b) Implementation

Learning at SMA 11 Tebo Regency was conducted in two sessions: Thursday, October 23 and 30, 2025, from 7:30–9:50 a.m. In the first session, the learning process took place in a conducive classroom environment supported by adequate internet access. The teacher began the learning activity with a prayer and student attendance check.

In the initial stages of learning, the teacher directs students' attention to the issue of forest and land fires by presenting illustrations in the form of images and short videos relevant to the surrounding environmental conditions. This presentation serves as a stimulus to build student interest while linking the learning material to real-life issues. The teacher then conveys the learning objectives and provides an overview of the activities to be carried out during the learning process. As initial reinforcement, the teacher provides a brief explanation of the basic concepts of forest and land fires using PowerPoint media. This explanation aims to provide an initial framework of understanding before students explore the material independently. Next, the teacher introduces Google Sites-based learning media used as a learning resource, while demonstrating how to access and navigate the content available within.

Figure 2. Student orientation to problem
Source: Research Document, 2025

In the core activity stage, students were directed to explore Google Sites independently. Students read the material, observe visual illustrations, and relate the information obtained to their experiences or prior knowledge about forest and land fires. This activity encouraged students to actively engage in the learning process and build initial understanding through independent exploration. After exploring the material, students took an online quiz available on Google Sites as a form of initial evaluation of understanding. This quiz served as a formative assessment to determine the extent to which students understood the basic concepts of forest and land fires. The quiz results indicated that students were able to follow the learning well and were actively involved in the use of digital learning media. The teacher facilitated a class discussion based on the results of the material exploration and the quiz results that students had completed. The discussion focused on clarifying concepts, strengthening understanding, and correcting misconceptions that emerged during the learning process. The teacher acted as a facilitator, directing the discussion to keep it relevant to the learning objectives and encouraging active student participation.

The first meeting concluded with a brief, collaborative reflection. The teacher and students summarized the key points learned, particularly regarding the basic concepts of forest and land fires and their impact on the environment. The teacher also provided a brief overview of the learning activities to be conducted in the next meeting before concluding with a prayer and greeting.

In the second meeting at State Senior High School 11, Tebo Regency, 27 students were divided into four groups to undertake further learning activities, including the development and presentation of educational posters on forest and land fires. The grouping was intended to encourage collaborative work and deepen students' understanding of the material explored in the previous meeting.

The results of the activity showed a variety of poster focuses that remained within the framework of disaster learning. The first group created a poster emphasizing community pre-disaster prevention or mitigation efforts for forest and land fires, such as avoiding land burning and increasing environmental awareness. The second group displayed a poster depicting the impacts of forest and land fires, particularly their impacts on health, the environment, and community activities, as a form of warning to encourage awareness of prevention. The third group focused its poster on the government's role in mitigating forest and land fires, including policy efforts, outreach, and preparedness. Meanwhile, the fourth group presented a poster on steps that communities need to take after a forest and land fire as part of post-disaster management efforts.

After the drafting process, each group presented their posters to the class. The presentation was followed by a short discussion involving other students through questions and responses related to the poster's content. Group 1 received a question regarding the importance of forest and land fire prevention measures by the community before entering the dry season. In response, the first

group explained correctly and precisely. Then, Group 2 was asked a question regarding the impact of forest and land fires that have been felt by the community. The second group delivered a correct and precise answer. Next, a question was posed to the third group regarding the role of the Tebo Regency government in mitigating forest and land fires. The group also explained correctly and precisely.

The discussion concluded with a question to the fourth group regarding the importance of post-forest and land fire disaster recovery. The fourth group explained their findings correctly and precisely. The teacher facilitated the discussion and provided reinforcement for the students' answers. The discussion demonstrated that students were able to relate the learning material to real-world conditions in their surroundings. Groups that demonstrated high-quality posters and were active in the presentation and discussion received rewards as a form of appreciation and to strengthen their motivation to learn.

Figure 3. Implementation of Forest and Land Fire Learning Assisted by Google Sites at SMA 11, Tebo Regency
Source: Research Document, 2025

At the end of the second meeting, the teacher asked students at SMA 11 Tebo Regency to fill out a questionnaire after the lesson and work on disaster literacy questions related to forest and land fires. The questionnaire was used to obtain an overview of the students' learning experiences during the series of lessons, specifically regarding the use of Google Sites media in supporting the understanding of forest and land fire material. The questionnaire was filled out in an orderly manner and participated by all students present. Based on the results of the questionnaire data processing, in general, students gave a positive response to the use of Google Sites media in learning about forest and land fire mitigation. Students assessed that Google Sites media was easy to access and use during the lesson, encouraged active involvement, and was useful in helping students understand the material on forest and land fire mitigation contextually. The conclusion from the questionnaire results was that the use of Google Sites was able to support the implementation of disaster learning effectively.

Figure 4. Literacy and Questionnaire Work
Source: Research Document, 2025

c) Learning Assessment

The learning process is assessed by observing student engagement, the quality of the posters they produce, and participation in class discussions. As a form of reinforcement, the teacher provides rewards to groups that meet these criteria. The purpose of providing rewards is to increase learning motivation and encourage active student involvement during the learning process.

In the first meeting, the learning process was assessed through a formative assessment in the form of an online quiz with true-false questions and observations of student engagement during the Google Sites media exploration. At SMA Negeri 11 Tebo Regency, the quiz results showed that most students had understood the initial material on forest and land fires, although there were still 7 out of 30 students who showed less than optimal understanding. However, observations during the learning activities showed that all students were actively involved in the material exploration and discussions, both independently and with classmates. In the second meeting, learning assessment was conducted through product and process assessments. The product assessment was in the form of a poster on forest and land fire mitigation which was assessed based on the criteria of content, creativity, and clarity of the message. In addition, the process assessment focused on aspects of group cooperation and student activeness in discussions and presentations.

Overall, the implementation of forest and land fire mitigation learning using Google Sites proceeded according to the planned learning process and standards. Google Sites effectively served as a learning supplement, supporting active student engagement, enhancing conceptual understanding, and facilitating the development of critical thinking and communication skills. The implementation results demonstrate that the use of digital media can strengthen the disaster management learning process without diminishing the teacher's primary role as a learning manager and facilitator.

2) Students' Disaster Literacy After Forest and Land Fire Learning

Students' understanding of disaster literacy was obtained after implementing forest and land fire disaster learning assisted by Google Sites media. Understanding of disaster literacy is a fundamental aspect in disaster learning, because it is the basis for students to recognize risks, understand information, and take appropriate attitudes towards potential disasters in their surroundings. Through forest and land fire disaster learning assisted by Google Sites, students are not only directed to master basic disaster concepts, but are also encouraged to develop the ability to apply information, communicate, and evaluate disaster information critically. Students' understanding of disaster literacy is further described based on disaster literacy indicators according to Brown et al., as follows.

a) Basic Disaster Literacy

In the basic disaster literacy indicator, learning about forest and land fire disasters assisted by Google Sites helps students understand the basic concepts of disasters, types of disasters, and early warning signs. Based on the results of the research respondent data on the basic disaster literacy indicator at SMA N 11 Tebo Regency, as many as 27 respondents, the data details obtained were 25 respondents (92%) had basic disaster literacy in the high category, 2 respondents (8%) had basic disaster literacy in the moderate category. The results of the analysis can be seen in Table 3.

Table 3. Basic Disaster Literacy

Value Range	Category	Frequency	Percentage (%)
40 – 52	Tall	25	92%
27 – 39	Currently	2	8%
Amount		27	100%
Lowest Value		36	
The highest score		52	
Average		42	

Source: Research Data, 2025

Then, to obtain a more detailed picture of the level of basic disaster literacy of students, the next analysis focused on understanding each parameter in Table 4.

Table 4. Results of Students' Understanding of Basic Disaster Literacy Indicators

Parameter	Number of Questions	State Senior High School 11, Tebo Regency			
		Total Answers	Correct	Wrong	Percentage (%)
Definition of forest and land fires, hotspots, and peatlands	2	54	49	5	90.7%
Factors causing forest and land fires	3	81	71	10	87.6%
Impact of forest and land fires	3	81	71	10	87.6%
The relationship between the dry season and the risk of forest and land fires	3	81	72	9	88.8%
Forest and land fire mitigation terms and institutions	2	54	47	7	87%

The analysis of basic disaster literacy of students at SMA Negeri 11 Tebo Regency showed a very good level of understanding across all tested parameters, with the percentage of correct answers above 87%. The highest level of understanding was found in the parameters of the definitions of forest and land fires, hotspots, and peatlands (90.7%), indicating that the basic terminological concepts have been well mastered by students. Meanwhile, understanding of the causes and impacts of forest and land fires reached 87.6% each, and the relationship between the dry season and the risk of forest and land fires reached 88.8%. This indicates that students not only understand basic concepts but are also beginning to be able to link natural phenomena with disaster risk. The parameters of terms and mitigation institutions obtained the lowest percentage, at 87%, although still in the high category. Overall, these findings indicate that students have a strong basic disaster literacy, although the institutional and mitigation aspects still need some strengthening.

b) Functional Disaster Literacy

Based on the analysis of the functional disaster literacy indicator, the majority of respondents (22 students (81%) were in the high category, while 5 students (19%) were in the moderate category.

This finding indicates that most students have a good understanding of basic disaster information, particularly regarding concepts, terms, and forest and land fire mitigation procedures. The average score of 42.3 confirms that students' overall ability to access, understand, and use disaster information is at an adequate level.

The high level of functional disaster literacy achievement indicates that students are not only able to recognize the definition and types of disasters but also understand basic mitigation steps that can be applied in everyday life. The presence of students in the moderate category indicates that a small number of students still need reinforcement, particularly in understanding disaster information more deeply and consistently. Thus, these results illustrate that students' functional disaster literacy skills have generally developed well, but still require ongoing reinforcement through contextual learning and the use of relevant learning media. The results of the analysis can be seen in Table 5.

Table 5. Functional disaster literacy

Value Range	Category	Frequency	Percentage (%)
40 – 52	Tall	22	81%
27 – 39	Currently	5	19%
Amount		27	100%
Lowest Value		28	
The highest score		48	
Average		42.3	

Source: Research Data, 2025

Then, to obtain a more detailed picture of the level of basic disaster literacy of students, the next analysis focused on understanding each parameter in Table 6.

Table 6. Results of Students' Understanding of Functional Disaster Literacy Indicators

Parameter	Number of Questions	State Senior High School 11, Tebo Regency			
		Total Answers	Correct	Wrong	Percentage (%)
Forest and land fire prevention measures	2	54	48	6	88.8%
Early signs of forest and land fires	3	81	71	10	87.6%
Appropriate actions when finding a fire point	2	54	49	5	90.7%
Use of official information for decisions	2	54	47	7	87%
Role of society/ school/government	3	81	71	10	87.6%

Source: Research Data, 2025

The analysis results show that the functional disaster literacy level of students at SMA Negeri 11 Tebo Regency is in the very good category, with the percentage of correct answers across all parameters above 87%. The highest understanding was found in the parameter of appropriate actions when detecting a fire spot (90.7%), indicating that students have good knowledge regarding the initial response to potential forest and land fires. The parameter of forest and land fire prevention measures obtained a percentage of 88.8%, followed by an understanding of the early signs of forest and land fires and the roles of the community, schools, and government, each reaching 87.6%. Meanwhile, the use of official information for decision-making obtained a percentage of 87%, which although the lowest score, still indicates a very good level of understanding. Overall, these findings indicate that students have adequate functional abilities in understanding and responding to information related to forest and land fire mitigation.

c) Communicative Literacy

Based on the results of questionnaire data processing on the Communicative Literacy indicator, it was found that 24 respondents (88%) had a high communicative literacy category, and 3 respondents (12%) were in the moderate category. The average score obtained was 45.7, with the highest score being 52 and the lowest being 38, reinforcing the finding that students' communicative literacy levels tended to be at a high level.The results of the analysis can be seen in Table 7.This achievement indicates that students are not only able to understand disaster information but also able to communicate it verbally and in writing, whether in the context of discussions, opinion pieces, or group work. This skill is crucial in disaster literacy because it requires students to convey mitigation messages clearly and accurately to others.

The students' high communicative literacy also reflects the effectiveness of the learning process, which encourages active interaction, exchange of ideas, and collaboration among students. In the context of disaster learning, good communication skills play a strategic role in building shared awareness, strengthening risk understanding, and fostering disaster preparedness. Therefore, these results indicate that students at SMA Negeri 11 Tebo Regency have developed a strong communicative literacy foundation, a crucial component in strengthening disaster literacy.

Table 7. Communicative Literacy of SMAN 11 Tebo Regency

Value Range	Category	Frequency	Percentage (%)
43 – 52	Tall	24	88%
33 – 42	Currently	3	12%
Amount		27	100%
Lowest Value		38	
The highest score		52	
Average		45.7	

Source: Research Data, 2025

d) Critical Disaster Literacy

Based on the results of questionnaire data processing on the critical disaster literacy indicator, the picture obtained is as shown in Table 8. 25 respondents (92%) have a high category of critical disaster literacy, 2 respondents (8%) in the medium category. The average score of 45.6 with the highest score of 52 and the lowest score of 37 shows the consistency of student achievement on this indicator. These results indicate that students are not only able to receive and understand information related to disasters, but also able to analyze, evaluate, and provide critical assessments of the disaster information obtained. This ability includes the ability to identify the causes and impacts of disasters, assess the accuracy of information, and consider alternative solutions or appropriate mitigation actions.

The high level of students' critical disaster literacy reflects that the learning process has encouraged the development of higher-order thinking skills, particularly in linking disaster knowledge to real-world conditions. In the context of disaster literacy, critical thinking skills are crucial because they play a role in fostering a sense of alertness, rational decision-making, and preparedness for potential disasters. Therefore, these results indicate that students at SMA Negeri 11 Tebo Regency have developed a strong critical literacy capacity as a foundation for strengthening disaster literacy as a whole.

Table 8. Critical Disaster Literacy of SMAN 11 Tebo Regency

Value Range	Category	Frequency	Percentage (%)
43 – 52	Tall	25	92%
33 – 42	Currently	2	8%

Amount	27	100%
Lowest Value	37	
The highest score	52	
Average	45.6	

Source: Research Data, 2025

Based on the discussion of the four disaster literacy indicators according to Brown et al., it can be concluded that learning about forest and land fire disasters using Google Sites contributes to shaping students' understanding of disaster literacy in a gradual and contextual manner. Students' understanding is evident not only in the mastery of basic disaster concepts but also in their ability to apply disaster information, communicate about disaster issues, and begin to develop a critical attitude towards the information received.

B. Discussion

Disaster mitigation is a systematic planning effort to minimize the impact of disasters, both on humans and the environment (Setyowati, 2019). A disaster itself is understood as a condition that arises as a result of certain events or activities that have the potential to cause risks and negative impacts on human life (Setyowati, 2019). This conceptual understanding serves as an important foundation for disaster management learning, as it emphasizes that mitigation focuses not only on post-disaster management but also emphasizes prevention, preparedness, and early risk reduction. In the educational context, particularly in areas prone to forest and land fires, mitigation learning needs to be contextually designed so that students can understand the risks of disasters that are closely related to life in the surrounding environment.

The results of implementing forest and land fire mitigation learning using Google Sites media indicate that the learning process is aligned with the principles of constructivist learning. In this approach, students are not positioned as passive recipients of information, but rather as active subjects who construct knowledge through interactions with materials, the environment, and peers. This is evident in independent exploration activities on Google Sites, group discussions, and reflections on disaster issues close to students' lives. According to Tyas et al., (2025), disaster learning that emphasizes the active involvement of students has proven to be more effective in building risk awareness and disaster preparedness than learning that is purely informative.

The teacher's role in implementing this learning also reflects the characteristics of constructivist learning. The teacher does not act as the sole source of knowledge, but rather acts as a facilitator, providing direction, guidance, and scaffolding throughout the learning process. The teacher helps students clarify concepts, relates the material to the real-life context of forest and land fires in Tebo Regency, and encourages meaningful discussions. This role pattern aligns with the findings. Bakhriansyah et al., (2025) which states that the effectiveness of disaster education increases when teachers function as directors of the thinking process and problem solving, not just as transmitters of material.

The use of Google Sites digital media also strengthens the quality of disaster education by providing flexible access to information, visual presentation of materials, and support for independent and collaborative learning. Through this media, students not only passively receive information but are actively involved in the learning process through material exploration and discussion. The integration of forest and land fire mitigation poster-making activities is a strategic part of the learning process because it provides space for students to construct disaster knowledge while developing communication skills. Through visual media, students learn to convey mitigation messages clearly, creatively, and contextually according to the surrounding environmental conditions. This is in line with Putri et al., (2024) which states that the use of web-based digital media in disaster learning can improve students' ability to communicate mitigation messages effectively, which is an important component in 21st century disaster literacy.

In addition to enhancing the communicative aspect of disaster literacy, the use of Google Sites

also contributes to the development of a digital learning culture in students. Saddam et al., (2025) emphasized that the use of digital technology in the learning process is effective in developing digital culture values and 21st-century competencies, such as critical thinking, creativity, communication, and collaboration. In the context of disaster learning, strengthening this digital culture is very important because students are not only required to understand disaster information, but also be able to access, process, and disseminate mitigation information responsibly through digital media. Thus, the use of Google Sites in forest and land fire mitigation learning not only contributes to improving students' disaster literacy but also supports the formation of an adaptive and relevant digital culture in facing disaster challenges in the digital era.

The findings of this study are in line with the results of research Juhadi et al., (2021) developed an integrated disaster education model to improve students' disaster mitigation literacy. The study showed that students' disaster mitigation literacy improved significantly when disaster learning was designed contextually, systematically, and integrated into the learning process. Juhadi et al. emphasized that disaster learning that actively involves students and links material to local conditions can improve disaster mitigation understanding, attitudes, and skills more effectively. These findings reinforce the research findings that forest and land fire mitigation learning assisted by Google Sites media contributes positively to improving students' disaster literacy.

In terms of disaster literacy achievement, the research results show that students' basic disaster literacy and functional disaster literacy are in the high category. Students are not only able to understand the basic concepts of forest and land fires, such as causes, impacts, and risks, but are also able to relate this information to mitigation efforts in everyday life. This finding supports the view Brown et al., (2014) which emphasizes that basic disaster literacy is the main foundation for the development of advanced disaster literacy, including functional abilities in using disaster information appropriately.

Strengthening communicative disaster literacy in this study is inseparable from the use of digital media and learning activities that emphasize collaboration. Through the use of Google Sites and poster-making activities, students are trained to develop mitigation messages in a structured, contextual, and visual manner. Students not only learn to understand disaster information but also develop the ability to convey mitigation messages creatively and responsibly through visual media (Prasetya et al., 2025). According to Sahudra et al., (2024), digital media-based disaster learning can improve students' communication skills because it provides a wider space for expression and reflection compared to conventional learning.

The high critical disaster literacy achievement in this study was also closely related to the implementation of problem-based learning and reflective discussions. Students were encouraged to analyze the relationship between dry season conditions, human activities, and the risk of forest and land fires, as well as to evaluate the roles of various parties in mitigation efforts. This aligns with the findings of the study. (Beri, 2022)which states that disaster learning based on problems and local contexts can improve students' critical thinking skills in understanding cause-effect relationships and making rational mitigation decisions.

Based on the discussion results, learning about forest and land fire mitigation using Google Sites media has been proven to be able to support the development of students' disaster literacy comprehensively, covering basic, functional, communicative, and critical disaster literacy aspects. The disaster literacy indicator that demonstrated the best performance at SMA 11 Tebo Regency was basic disaster literacy, 25 students (92%) were in the high category with an average score of 46, indicating that most students understood the basic concepts of forest and land fires, such as their definition, causes, and impacts. This achievement was supported by the use of Google Sites, which presented material in a structured manner through text, videos, and contextual information, making it easier for students to understand disaster concepts. Conversely, the indicator with lower achievement was critical disaster literacy, as students still tended to

accept information obtained without double-checking the source or conducting a more in-depth evaluation of the information. The integration of a constructivist approach, local context, and the use of digital media contributes to improving students' understanding, communication skills, and critical thinking on disaster issues. These findings indicate that the use of digital media designed contextually and systematically has the potential to be an alternative effective disaster learning strategy in secondary schools, especially in areas prone to forest and land fires.

4. Conclusion

Based on the research results and discussion, it can be concluded that forest and land fire mitigation learning assisted by Google Sites media can be implemented effectively at SMA Negeri 11 Tebo Regency. Google Sites media functions as a learning supplement that can enrich learning resources, facilitate independent exploration of material, and encourage active student involvement in the learning process. The implementation of learning that is designed systematically and contextually also supports the creation of an interactive and meaningful learning atmosphere.

The evaluation results showed that students' disaster literacy levels after participating in the learning were in the high category across all indicators, including basic disaster literacy, functional disaster literacy, communicative literacy, and critical disaster literacy. These findings indicate that students are not only able to understand the basic concepts of forest and land fires, but also can apply mitigation information in everyday life contexts, communicate disaster messages effectively, and demonstrate critical thinking skills regarding forest and land fire information and issues. Thus, Google Sites-assisted learning contributes positively to strengthening students' disaster literacy comprehensively. This research is limited to forest and land fire material and a relatively short implementation time, so it is recommended that further research examine disaster literacy in other types of disasters with a broader scope and research duration.

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6. References

Ahsan, M. S., Zakaria, Z., Hadi, Z., Kurni, S. E. A., & Kusrini, K. (2022). Forest fire predicting using Naive Bayes and KNN algorithm. *Sinkron*. https://api.semanticscholar.org/CorpusID:253378864

Amin, F., & Bahri, M. S. (2024). The Role of Visual Storytelling in Enhancing Disaster Risk Knowledge: Developing Digital Comics for Landslide Mitigation Education. *Future Space: Studies in Geo-Education*. https://api.semanticscholar.org/CorpusID:273918425

Arfianti, D. (2021). Development Of E-Magazine Materials for Disaster Mitigation Outbreak to Increase Preparedness of High School Students. *Journal Of Biology Education Research (JBER)*. https://api.semanticscholar.org/CorpusID:246402498

Arshad, A., Azhar, A. A., & Anjali, K. S. (2022). Impact of forest fire on forest ecosystem.

Journal of Agriculture and Technology, *9*(1–2), 18–29.

Bakhriansyah, H. M., Anhar, V. Y., & Noor, I. H. (2025). *Meningkatkan Kesiapsiagaan Bencana Pada Sekolah*. Uwais Inspirasi Indonesia.

Beri, N. (2022). Development and Validation of Alienation Scale for Secondary School Teachers to Find out Gender Differences in Alienation. *International Journal of Instruction*, *15*(3), 357–376.

BNPB. (2023). *Data Bencana Indonesia 2023*. https://bnpb.go.id/

Brown, L. M., Haun, J. N., & Peterson, L. (2014). A proposed disaster literacy model. *Disaster Medicine and Public Health Preparedness*, *8*(3), 267–275. https://doi.org/10.1017/dmp.2014.43

Cisnaulin, D., Ghosh, M., & Putra, A. (2025). The Effect of Creative Problem Solving Learning Model Assisted by Google Sites on Creative Thinking Ability in Geography Learning. *Future Space: Studies in Geo-Education*, *2*(1). https://doi.org/10.69877/fssge.v2i1.56

Damayanti, N., Hia, S., Waruwu, W., & Kartika, J. (2024). Learning from Firefighters: A Goal-Free Evaluation of Fire Disaster Mitigation Program for Early Years Students. *Paedagogi: Jurnal Kajian Ilmu Pendidikan (e-Journal)*, *10*(2). https://doi.org/10.24114/paedagogi.v10i2.64468

Imardiani, S., Romadoni, S., & Utami, F. (2023). Effect Of Educational Media Picture Card On Knowledge Of Fire Disaster Response In School-Age Children. *Jurnal Inspirasi Kesehatan*, *1*(2). https://doi.org/10.52523/jika.v1i2.57

Juhadi, Hamid, N., Trihatmoko, E., Herlina, M., & Aroyandini, E. N. (2021). *Developing a Model for Disaster Education to Improve Students ' Disaster Mitigation Literacy*. https://doi.org/10.20965/jdr.2021.p1243

Kaban, P. A., Kurniawan, R., Caraka, R., Pardamean, B., Yuniarto, B., & Sukim. (2019). Biclustering method to capture the spatial pattern and to identify the causes of social vulnerability in Indonesia: A new recommendation for disaster mitigation policy. *Procedia Computer Science*. https://doi.org/10.1016/j.procs.2019.08.138

Khairunnisa, F., & Rosalena, I. (2019). GIS Application in Mapping of Forest and Land Fires and Mitigation in Banjarbaru City, South Kalimantan. *IOP Conference Series: Earth and Environmental Science*, *273*. https://doi.org/10.1088/1755-1315/273/1/012049

KLHK. (2020). *Data dan Informasi Kebakaran Hutan dan Lahan Tahun 2019*. Kementerian Lingkungan Hidup dan Kehutanan.

Koesbardiati, T., Pandin, M. G. R., & Fadhillah, A. (2023). Analyzing Forest and Land Fire Disaster Prevention Programs in Riau, Indonesia. *Qubahan Academic Journal*. https://doi.org/10.58429/qaj.v3n4a173

Maulana, A., Rahman, A., Aulia, N. A., Nur, A., Firmansyah, M., & Gunawan, B. A. (2024). Paradigma Penanggulangan Bencana: Tanggung Jawab Pemerintah Daerah dan Mitigasi Berbasis Kearifan Lokal. *Collegium Studiosum Journal*, *7*(2), 667–677.

Mulianingsih, F., & Hardati, P. (2022). Can Disaster Risk Education Reduce the Impact of Disasters in Schools? *Journal of Geography Science and Education*. https://api.semanticscholar.org/CorpusID:253487247

Naibaho, M. T. R. (2024). *Penggunaan Media Interaktif Google Sites terhadap Keterampilan Berpikir Kritis dan Hasil Belajar Geografi* [Universitas Pendidikan Ganesha]. https://repo.undiksha.ac.id

Nawira, A. A., Murniati, L. R., & Hiyama, C. (2023). Potret rehabilitasi di Indonesia: Dampak

dan pembelajaran dari sepuluh studi kasus. In *Rehabilitasi Hutan di Indonesia*. https://pdfs.semanticscholar.org/ba60/7be4bcb9d36c80adaa662e44c7f6a0b53f0f.pdf

Normile, D. (2019). Parched peatlands fuel Indonesia's blazes. *Science*, *366*(6461), 18–19. https://doi.org/10.1126/science.366.6461.18

Noviana, E., Kurniaman, O., Guslinda, G., Zufriady, Z., Erlinda, S., Sari, I., Mulyani, E., Dewi, R., Zulkifli, Z., & Wilson, W. (2023). Preliminary Study on the Design of Forest and Land Fire Disaster Learning Media for Elementary Schools. *SHS Web of Conferences*. https://doi.org/10.1051/shsconf/202317302006

Prasetya, S., Sitohang, L., Fadirubun, F., Murtini, S., & Hidayati, A. (2025). Development of Contextual Disaster Multimedia to Improve Literacy, Interest and Awareness of Disaster Mitigation in Social Science Subjects. *International Journal of Research and Innovation in Social Science*. https://doi.org/10.47772/ijriss.2025.906000124

Prayoga, J. (2024). *Mitigasi Bencana Dalam Bidang IT*. Google Books. https://books.google.com/

Putri, P. H., Banowati, E., & Sanjoto, T. B. (2024). Development of the Disaster.co Website as a Digital Learning Media to Train 21st Century Students' Skills Through Geography Learning. *International Journal of Research and Review*. https://doi.org/10.52403/ijrr.20240933

Riyanto, I., Cahyadi, A., Kurniadhini, F., Bachtiar, H., Apriyana, D., & Caraka, B. K. A. (2020). Understanding Forest Fire Management in Indonesia from a Global Perspective. *Asean Journal on Science and Technology for Development*, *37*, 1–6–1–6. https://api.semanticscholar.org/CorpusID:219019777

Roslan, R., Arifin, A. N., Daud, F., Hiola, S. F., & Jasman, M. W. (2024). Analysis of The Practicality of Google Sites Web-Based Learning Media on The Skeletal System Material for Student Grade XI. *Educational Administration: Theory and Practice*. https://doi.org/10.53555/kuey.v30i11.8576

Rozikin, M., Wijaya, A. F., & Riyadi, B. S. (2023). Sustainable Development: Disaster Risk Reduction of Forest and Land Fire in Indonesia. *International Journal of Membrane Science and Technology*. https://api.semanticscholar.org/CorpusID:260074497

Ruswandi, D., Sumartono, S., Maarif, S., & Wijaya, A. F. (2021). Strategic Analysis of Collaborative Governance for Disaster Management on Forest and Land Fires in Indonesia. *International Journal of Criminology and Sociology*. https://api.semanticscholar.org/CorpusID:245623199

Saddam, Setyowati, D. L., Wijaya, A., & Juraedah, A. (2025). Efektivitas Pemanfaatan Teknologi Digital dalam proses Pembelajaran Berbasis Nilai Digital Culture. *Madani: Jurnal Pendidikan IPS Dan Ilmu Sosial*, *01*, 34–52.

Sahudra, T. M., Kenedi, A. K., Asnawi, Sutrisno, I. H., Ardiansyah, T., & Sitepu, I. A. B. (2024). Community-Based Web-Learning Media for Disaster Mitigation Understanding of University Students. *Jurnal Edutech Undiksha*, *12*(1), 112–120. https://doi.org/10.23887/jeu.v12i1.66137

Setyowati, D. L. (2019). *Pendidikan Kebencanaan*. Universitas Negeri Semarang.

Silitonga, M., & Zaharah, Z. (2023). Pentingnya Teknologi pada Sistem Pembelajaran Dalam Jaringan di masa Bencana Kabut Asap Akibat Kebakaran Hutan dan Lahan di Kota Jambi: (The Importance of Technology in Networked Learning Systems during the Haze Disaster Due to Forest and Land Fires in Ja. *BIODIK*, *9*(3 SE-Articles), 162–168. https://doi.org/10.22437/biodik.v9i3.28660

Siregar, A. A., Lestari, M., Novrikasari, N., Putri, D. A., Andarini, D., & Nandini, R. F. (2021). Kebakaran Lahan Basah dan Faktor Manusia Sebagai Penyebabnya. *EnviroScienteae*. https://api.semanticscholar.org/CorpusID:244217100

Suharini, E., Ariyadi, M., & Kurniawan, E. (2020). Google Earth Pro as a Learning Media for Mitigation and Adaptation of Landslide Disaster. *International Journal of Information and Education Technology*, *10*. https://doi.org/10.18178/ijiet.2020.10.11.1464

Tahmidaten, L., & Krismanto, W. (2019). Implementasi pendidikan kebencanaan di Indonesia (sebuah studi pustaka tentang problematika dan solusinya). *Lectura: Jurnal Pendidikan*, *10*(2), 136–154.

Tan, Z., Carrasco, L., & Taylor, D. (2020). Spatial correlates of forest and land fires in Indonesia. *International Journal of Wildland Fire*. https://doi.org/10.1071/WF20036

Tebo, D. P. dan K. K. (2023). *Surat Edaran Kadisdikbud Kab. Tebo Nomor 420/2874.1/DIKBUD/2023 tentang Kegiatan Belajar Mengajar Pada Masa Kabut Asap*. Dinas Pendidikan dan Kebudayaan Kabupaten Tebo. http://dinasdikbud.tebokab.go.id/2023/10/surat-edaran-kadisdikbud-kab-tebo-nomor.html

Thoha, A. S., Istima, N., Daulay, I. A., Hulu, D. L. N., Budi, S., Ulfa, M., & Mardiyadi, Z. (2023). Spatial distribution of 2019 forest and land fires in Indonesia. *Journal of Physics: Conference Series*, *2421*(1), 12035. https://doi.org/10.1088/1742-6596/2421/1/012035

Triana, N., Fernalia, F., & Kurniati, T. R. (2023). Pengaruh Media Pendidikan Kesehatan Booklet Terhadap Pengetahuan Mitigasi Bencana Banjir. *Jurnal Sains Kesehatan*, *30*(1), 32–39.

Tyas, R. A., Wilujeng, I., Rosana, D., Kuswanto, H., & Purwasih, D. (2025). A review of disaster risk reduction education implementation: Integration, trends, and trajectories. *Social Sciences & Humanities Open*, *12*, 102015. https://doi.org/https://doi.org/10.1016/j.ssaho.2025.102015

Wang, Z., Han, Z., & Li, Y. (2023). The Interplay between School Preparedness and Student's Individual Protective Actions: The Mediating Role of Disaster Education. *Sustainability*. https://api.semanticscholar.org/CorpusID:264151033

Yustina, Y., & Kapsin, K. (2017). The Implementation of Constructivism-Based Student Worksheets within The Theme 'The Prevention of Land and Forest Fire' in Science Education for Grade VII of Secondary Schools in Riau. *Jurnal Pendidikan IPA Indonesia*, *6*, 298–305. https://api.semanticscholar.org/CorpusID:54824059