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Strengthening Student Disaster Preparedness through the SEKATABE (Disaster Preparedness and Resilience Schools) Program in Bengkulu City

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Abstract: This community service program aims to enhance students' disaster preparedness and foster a disaster-aware and resilient school environment through the development and implementation of SEKATABE, a game-based educational tool for disaster preparedness. The program was conducted at SMAN 6 in Bengkulu City, Indonesia, involving 60 students and three teachers. The activities comprised three main stages: outreach, training, and a demonstration of SEKATABE. During the outreach stage, participants received information on disaster types and risks in Bengkulu City, disaster mitigation and preparedness concepts, and the use of SEKATABE as a disaster education tool. The training stage focused on developing students' and teachers' competencies in disaster preparedness and emergency response, including the preparation of disaster risk maps and school evacuation routes, as well as the use of a web-based disaster simulation game. The demonstration stage involved hands-on practice with SEKATABE, evacuation drills, and the implementation of emergency response standard operating procedures (SOPs) within the school environment. Program outcomes were evaluated using pretests and posttests to assess changes in knowledge, a preparedness questionnaire to measure students' readiness, observation sheets to assess performance during simulations, and a teacher feedback questionnaire to evaluate the use of SEKATABE. The data were analyzed descriptively using percentages, mean scores, and normalized gain (N-gain) to assess improvements in learning outcomes. The results showed an increase in the proportion of correct answers from 49.5% on the pretest to 81.67% on the posttest. Regarding disaster preparedness, 67.5% of students were classified as very prepared, 18.9% as prepared, and 13.6% as less prepared. SEKATABE was developed as a web-based disaster education game accessible at sekatebe.com and received positive feedback from 90% of participating teachers. Simulation observations also indicated that students evacuated more quickly and in a more coordinated manner. The program produced disaster education materials, school evacuation route maps, emergency response SOPs, and disaster education guidelines. These outputs provide practical resources for strengthening school-level disaster preparedness and offer potential for adaptation and replication in other schools.

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Introduction

International practices on disaster preparedness assume that humans, especially at the household and community levels, play an important role in preventing anticipated natural

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disasters (Cox et all, 2019). This condition certainly requires us to have a good response in anticipating disasters. Natural disasters such as earthquakes, floods, landslides, and the potential for tsunamis necessitate preparedness, particularly in the field of education (Alfi & Maryani, 2019). The role of education is certainly vital in creating preparedness, which can be an important pillar in efforts to improve and foster preparedness (Maryani & Fatmawati, 2020). Schools are the best place to achieve the above. State Senior High School (SMAN) 6 in Bengkulu City is one of the disaster-prepared schools. However, according to the results of a study conducted in 2023, the student preparedness index is in the ready category but with an index score of only 71.25 (Alfi et all, 2024). With an index score of only 71.25, the school is certainly very vulnerable given the region's frequent occurrence of major earthquakes and even the potential for tsunamis.

SMAN 6 Bengkulu City is located approximately 1 km from the coast. Being in an area with narrow roads and a large number of students will certainly be a problem when a disaster occurs. Understanding evacuation access is also very important. This shows the need to increase capacity through a more structured and integrated approach to disaster education in the school system (BPBD Kota Bengkulu, 2023). This improvement can be done by providing input and training to teachers to strengthen innovation in disaster education (Furhmann et all, 2008). Innovative learning based on disaster simulation games will be one effective way to increase student preparedness. This game-based learning innovation is designed to make it easier for teachers to transfer knowledge and values to students. Teachers will find it easier to convey disaster-related material to students, and students will also find learning more interesting through these disaster simulation games.

The main challenges in implementing disaster education at SMAN 6 Bengkulu are not only technical, such as the lack of innovative teaching materials, but also structural and pedagogical. Teachers often struggle to present disaster-related content in an engaging, contextual, and practical way, as the material tends to be abstract and delivered through conventional methods. This limits learning to basic knowledge acquisition, without reaching applied and reflective levels, resulting in weak internalization of preparedness values. Moreover, limited teacher capacity in integrating disaster literacy with local risk contexts further reduces the relevance and effectiveness of learning.

At the same time, limitations in physical evacuation infrastructure remain a critical issue that weakens practical preparedness. The lack of proper evacuation routes, signage, and safe assembly points creates a gap between theoretical understanding and real-world application. By integrating digital learning tools with hands-on evacuation drills led by trained teachers, disaster education can balance cognitive, affective, and psychomotor aspects. This integrated approach ultimately enhances students' real evacuation skills and builds a more comprehensive culture of disaster preparedness within the school.

To address these gaps, the development of a disaster-themed educational game offers a strategic solution by providing interactive, contextual, and scenario-based learning experiences. However, its effectiveness depends on strengthening teacher capacity through a Training of Trainers (ToT) model. Through ToT, teachers are empowered not only as users but also as facilitators who can independently design and adapt disaster learning. This approach promotes school autonomy and ensures the sustainability of knowledge transfer through collaborative forums such as MGMP. Conditions SMAN 6 Bengkulu City has conditions that greatly influence the socioeconomic situation of the surrounding community. Social and economic contact naturally makes the area around the school bustling and a center of activity. As a center of activity, it will be very vulnerable if students do not have good

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knowledge of disasters in the event of a disaster. The community at SMAN 6 Bengkulu City must have a good understanding of disasters in order to become an important pillar in the surrounding community. The knowledge and skills of students and teachers regarding disasters must be continuously developed so that they can become a place for the community to ask questions and discuss disasters. In addition, good disaster management skills must also be improved for teachers and students so that they are able to carry out pre-disaster, during-disaster, and post-disaster activities. All these aspects will be developed into a disaster simulation game design to make SMAN 6 Bengkulu City SEKATABE. In terms of accessibility, the school still lacks complete self-rescue signs, good physical facilities, and has narrow roads. However, the school also has an information website and social media, and, equally important, good access to information.

The community service activity aimed at enhancing students' disaster preparedness through the School of Disaster Preparedness and Resilience (SEKATABE) in Bengkulu City was successfully carried out. The objective of this activity was to develop and design a web-based game (sekatebe.com) for students to use in disaster education. We also held a meeting with the Geography Teachers' Working Group (MGMP) to gather input on what content to include, features to add to the design, and to provide training on the use of sekatebe.com.

1) Problems

a) Social aspects in the field of education.
The lack of innovative teaching materials and learning resources has hindered efforts to improve disaster preparedness at SMAN 6 in Bengkulu City. Furthermore, the region's vulnerability to natural disasters—which could potentially result in significant loss of life—makes the school a key focal point for disaster education. This, of course, presents a major challenge that requires a solution. One approach is to design a disaster-themed educational game to enhance students' disaster preparedness. This application will be rolled out gradually through the Geography Teachers' Working Group (MGMP) so that all geography teachers in Bengkulu City can utilize it as an effective and efficient learning resource. It will then be pilot-tested with students to assess its effectiveness, providing valuable feedback for improving the app's quality in the future.

b) Management aspects in the field of improving management skills
Due to students' lack of knowledge and skills regarding disaster preparedness, disaster management is naturally absent from their skill set. This will create a chain reaction if not addressed promptly. The development of a disaster-themed game app will undoubtedly enhance students' knowledge, skills, and preparedness, enabling them to understand how to effectively manage disaster mitigation. Moreover, this aspect of management capability in geography is closely linked to an individual's spatial intelligence. Once students possess the necessary knowledge, skills, and disaster preparedness capacity, their mindset will naturally facilitate the management of key actions required during pre-disaster, during the disaster, and post-disaster phases. Therefore, education and the enhancement of management capabilities must always proceed in tandem. The impact and benefits of the program for the broader community are undoubtedly significant. Since schools produce graduates every year, these graduates when interacting with the community will possess good understanding, skills, and disaster preparedness, and will certainly serve as a source of learning within the community. Additionally, the findings of this research can also be accessed by the public as a source of knowledge.

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Method

This community service activity was implemented using a participatory approach consisting of outreach, training, and demonstration/simulation, involving teachers and students from SMAN 6 Bengkulu City as the primary partners. This approach was selected because improving disaster preparedness in school environments requires not only the transfer of knowledge but also the development of practical skills and hands-on experience. Disaster education through outreach and simulation can improve students' understanding and preparedness in facing potential disasters (Zain et al., 2023), while training accompanied by simulation has been shown to improve participants' knowledge and skills in performing rescue and evacuation procedures in school environments (Roslaeni et al., 2022). A similar approach has also been implemented in schools in Bengkulu City through disaster education, disaster response training, and earthquake simulation (Agustinawati et al., 2024). The activity began with coordination with the school principal and teachers to identify initial conditions, potential disaster risks, and partner needs.

The outreach stage focused on increasing teachers' and students' knowledge and awareness of disaster risks, particularly earthquakes, tsunamis, and floods in Bengkulu City, as well as disaster mitigation principles, individual and school preparedness, and self-rescue measures before, during, and after a disaster. At this stage, SEKATABE (Disaster-Ready and Resilient Schools) was introduced as a web-based disaster education platform containing disaster learning materials, interactive quizzes, evacuation simulations, and visual guides. The integration of learning media with disaster education and preparedness practices was intended to provide students with a more contextual and interactive learning experience. Outreach activities combined with disaster mitigation simulations have been reported to improve students' knowledge and preparedness in responding to earthquake hazards (Zain et al., 2023). Similarly, disaster mitigation outreach and simulation activities have been shown to strengthen students' understanding and preparedness in facing potential disaster situations (Rusiyah et al., 2023).

The training and demonstration/simulation stages were designed to strengthen participants' practical skills in applying disaster preparedness knowledge and utilizing SEKATABE. Training was conducted interactively through material presentation, discussion, practical exercises, and mentoring. Teachers were trained to utilize SEKATABE as a supporting medium for learning and disaster education, while students practiced identifying potential hazards, determining appropriate self-rescue actions, understanding emergency response procedures, and recognizing evacuation routes and assembly points. The training also covered the identification and practice of school risk maps, evacuation routes, assembly points, disaster warning signs, and emergency response SOPs. Training activities that combine theoretical instruction with practical exercises and self-rescue simulations have been shown to improve participants' disaster preparedness knowledge and skills (Roslaeni et al., 2022). The demonstration stage provided direct examples of how to access and use SEKATABE, including learning materials, interactive quizzes, evacuation simulations, and visual disaster preparedness guides, followed by independent practice under the guidance of the community service team. Similar disaster preparedness training combined with practical evacuation simulation has also been reported to improve students' knowledge and practical skills in responding to flood emergencies (Wijayanti et al., 2026).

Furthermore, simulation-based disaster education has been shown to improve students' preparedness for earthquake and tsunami hazards (Lestari et al., 2022), while training and simulation can strengthen participants' abilities to conduct search, rescue, and

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evacuation procedures (Andung et al., 2025). In the Bengkulu context, demonstrated the relevance of disaster response training followed by earthquake simulation for strengthening preparedness among school communities in disaster-prone areas (Agustinawati et al., 2024). The evaluation stage was conducted to assess the effectiveness of the program in improving participants' knowledge, preparedness, practical skills, engagement, and acceptance of SEKATABE. Several instruments were employed, including pretests and posttests to measure changes in disaster-related knowledge, a Likert-scale questionnaire to assess students' preparedness levels, an observation sheet to evaluate participants' skills and engagement during training and simulations, and a teacher response questionnaire to assess the acceptance, usability, and usefulness of SEKATABE as a disaster education medium. Quantitative data were analyzed descriptively using percentages and mean scores, while knowledge improvement was assessed using the N-Gain score based on pretest and posttest results. Observation data and participant feedback were analyzed descriptively to identify changes in understanding, skills, engagement, and acceptance of the activities. The use of pretest and posttest assessments combined with education, training, simulation, and evacuation drills has also been applied in disaster-resilient school programs to measure changes in participants' knowledge and preparedness (Herman et al., 2025). The evaluation results were used as a basis for follow-up activities, including the continued use of SEKATABE, periodic evacuation simulations, and integration of disaster preparedness education into routine school activities. Through these stages, the program was designed not only to improve disaster-related knowledge but also to develop practical preparedness skills and strengthen the capacity of the school community to respond effectively to disaster situations.

Result and Discussion

Results Of Activity Implementation and Completion

1) Implementation of Socialization and Simulation:

Aspect Of Activity 1 At the First Partner

Socialization Activity at SMAN 6 Bengkulu City Regarding SEKATABE

The SEKATABE (Disaster Preparedness and Resilience School) socialization activity at SMAN 6 Bengkulu City was conducted to enhance the knowledge and preparedness of the school community regarding potential local disasters. Involving students, teachers, and educational staff, the activity aimed to build collective awareness of disaster preparedness through structured and participatory approaches. Participants gained an understanding of disaster risks in Bengkulu, including earthquakes, tsunamis, and fires, while simple simulations enabled them to practice self-rescue actions, increasing both confidence and practical readiness. The activity also highlighted the crucial role of teachers and school institutions in sustaining the program, particularly through integrating disaster preparedness into learning and fostering a resilient school culture. Overall, the results indicate that the SEKATABE socialization had a positive impact on improving knowledge, attitudes, and preparedness of the school community. Therefore, continuous implementation of such programs is essential to create a safe, alert, and disaster-resilient school environment. The following are documentation photos of the SEKATABE socialization activities at SMAN 6 Bengkulu City: (a) and (b) socialization sessions on potential natural disasters in Bengkulu City.

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(a) (b)

Figure 1. At The First Partner Disaster Training and Simulation Activities at SMAN 6 Bengkulu City to Build Sekatabe

Disaster training and simulation activities at SMAN 6 Bengkulu City, held on December 8, 2025, were conducted as part of the SEKATABE (Disaster Preparedness and Resilience School) program to enhance the knowledge and preparedness of students, teachers, and educational staff. The training included systematic delivery of material on disaster risks in Bengkulu, particularly earthquakes and tsunamis, covering types, causes, impacts, and basic self-rescue skills such as protection techniques, evacuation procedures, and first aid. Participants engaged in case studies and practical exercises, culminating in an earthquake simulation followed by evacuation to designated assembly points. All school members actively participated according to their roles, demonstrating improved coordination, responsiveness, and adherence to procedures. The results indicate that most participants were able to carry out evacuation effectively, confirming the effectiveness of training and simulation in strengthening disaster preparedness. The activity also highlighted the crucial role of teachers and school management in sustaining the program through curriculum integration and provision of supporting facilities. Overall, this activity successfully improved knowledge, skills, and attitudes toward disaster preparedness, contributing to the development of a safe, alert, and resilient school environment. The following are photos of disaster training and simulation activities at SMAN 6 Bengkulu City.



(a) (b)

(c)

Figure 2. Disaster Training and Simulation Activities At SMAN 6 Bengkulu City (a) Training on Protecting the Head with Hands in the Event of an Earthquake, (b) Training on Using Bags to Protect the Head in the Event of an Earthquake, (c) Victim Rescue.

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2) Program Effectiveness

Aspect Of Activity 3 At the First Partner

Capacity Building for SEKATABE SMAN 6 Bengkulu City through learning

a) High School Students' Knowledge and Preparedness Levels in Bengkulu City in Facing Potential Disasters

Table 1. Students' Knowledge of Disasters at Senior High Schools in Bengkulu City

No	Research Questions	Percentage of Respondent Answers			
		Pre test		Post test	
		correct	Incor-rect	correct	Incor-rect
	Percentage	**49.5%**	**50.5%**	**81.67%**	**18.33%**

Source: Annual data analysis, 2025

Based on Table 4.5, the results show that the knowledge of students at SMA N 6 Bengkulu City when the pre-test was conducted on 60 students showed that 49.50% answered correctly and 50.5% answered incorrectly. After being given teaching materials on disaster mitigation, there was a significant change in knowledge, with 81.67% of the 60 students answering correctly and 18.33% answering incorrectly. This certainly shows the significant influence of the teaching materials developed on changes in students' knowledge about disasters.

The increase in students' knowledge scores from 49.50% to 81.67% indicates that the educational game-based teaching materials used are highly effective in improving students' understanding of disaster mitigation. This can be explained by the visual and interactive nature of the learning media. Visual media helps students concretize abstract concepts-such as the processes behind earthquakes, floods, and volcanic eruptions-through images, symbols, and illustrations, making them easier to understand and remember. Additionally, the game elements encourage active student engagement in the learning process, which leads to increased attention and motivation. Research in national journals also supports these findings, as reported by Wibowo (2018) in the Indonesian Journal of Science Education, which states that the use of visual-interactive media can significantly improve learning outcomes because it engages more senses in the learning process. Similarly, research by Sari and Setiawan (2020) in the Journal of Geography Education indicates that game-based learning media can improve understanding of disaster concepts more effectively than lecture methods.

These findings are also consistent with various studies and community service initiatives in Indonesia that utilize similar media. For example, a study by Pratama et al. (2021) in the Journal of Community Service (JPKM) reported that the use of disaster-themed board games significantly improved students' knowledge and preparedness following the intervention. Additionally, a study by Lestari et al. (2019) in the Journal of Education and Culture indicates that education-based game learning provides a more meaningful learning experience by combining visual, interactive, and contextual elements. These findings reinforce the notion that the 81.67% increase observed in this study is likely influenced by the visual nature of the games used. However, this improvement is also influenced by the overall instructional design, which creates an active, enjoyable, and relevant learning experience for students, thereby leading to a significant increase in knowledge.

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b) Student Preparedness for Disasters at Senior High Schools in Bengkulu City

Table 2. Student Preparedness for Disasters at Senior High Schools in Bengkulu City

No	Research Questions	Percentage of Respondent Answers			
		SS	S	KS	TS
a)	**Knowledge About Disasters**				
	Percentage	62%	28%	10%	
b)	**Preparedness Planning**				
	Percentage	65%	25.8%	13.2%	
c)	**Practical Skills**				
	Percentage	43.8%	24.2%	32%	
d)	**Logistics Resources**				
	Percentage	83.4%	8.3%	8.3%	
e)	**Attitude and Self-Confidence**				
	Percentage	83.4%	8.3%	8.3%	

*SS: Strongly Agree; S: Agree; KS: Disagree; TS: Strongly Disagree;
Source: Annual data analysis, 2025

Table 3. Preparedness Knowledge

No	Criteria	Frekuency	Percentage
1)	Very Ready	40	67.5%
2)	Ready	11	18.9%
3)	Not Ready	9	13.6%
	Amount	60	100%

Source: Annual data analysis, 2025

The increase in knowledge, which previously stood at 81.67%, strongly contributed to the high level of student preparedness, with 67.5% falling into the “very prepared” category. This indicates that a good understanding of disasters directly influences aspects of preparedness such as knowledge, planning, and even attitudes and self-confidence. One of the main factors driving this improvement is the use of visual and interactive game-based learning media. Visual media allows students to understand disaster concepts more concretely, while the game elements enhance active engagement and meaningful learning experiences, making knowledge easier to internalize and apply in the context of preparedness. These findings align with research by Lestari et al. (2019) in the Journal of Education and Culture, which states that visual-interactive learning media can improve students’ understanding and preparedness for disasters, as well as research by Pratama et al. (2021) in the Journal of Community Service (JPKM), which showed that the use of disaster education games significantly increased students’ knowledge and preparedness. Thus, this significant improvement is influenced not only by the visual nature of the games but also by the interactive and contextual learning design that effectively connects knowledge with practical preparedness in a tangible way.

c) Development of the SEKATABE Product (sekatebe.com)

Supporting Tools

The system developed in this study is supported by a combination of software and hardware to ensure efficient development and implementation. On the software side, Windows 11 is used as the operating system, Unity WebGL as a browser-based game development platform, and Visual Studio Code as the code editor. The application is executed through web browsers such as Google Chrome, Mozilla Firefox, and Microsoft

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Edge. Additionally, ExpressJS functions as the backend framework for managing data communication, Microsoft Office Word 2016 is used for documentation and report preparation, and Balsamiq Mockup is utilized for designing the user interface (UI/UX). On the hardware side, the development process is carried out using an Asus ZenBook laptop equipped with an AMD Ryzen 5500U processor, 8GB DDR4 RAM, 256GB SSD storage, and an NVIDIA GeForce MX450 graphics card, which adequately supports programming and graphical processing tasks, while a printer is used to facilitate the printing of documentation and reports.

System Development Methods

The method used in developing the disaster mitigation educational game "Students Through Disaster Preparedness and Resilience Schools (SEKATABE)" is an iterative development model. This approach allows for continuous improvement by testing each iteration of the system. The development stages include planning, design, implementation, testing, and continuous improvement.

Program Code Writing / Implementation

At this stage, the game implementation process begins with writing the program code that will execute all the previously designed features and mechanisms. This game was developed using *Unity WebGL* , with *C#* as the primary programming language. The game is designed to run in a web *browser* without the need for additional applications, allowing the target *audience* to access it directly through the web.

a. Research Flow Diagram

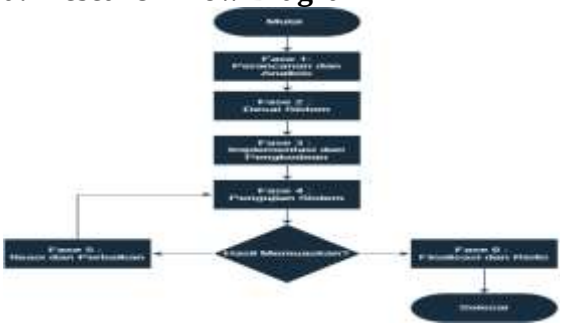


Figure 3. Research Flowchart

b. Interface Design/Mockup



Figure 4. System Navigation Structure



Figure 5. Login Page Mockup



Figure 6. Main Menu Page Mockup



Figure 7. Level Selection Page Mockup



Figure 8. Game Play Page Mockup

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Figure 9. Profile Page Mockup

d) Partner Responses and Sustainability (sekatebe.com)

Teacher Response and Participation

During the socialization, the teachers demonstrated high enthusiasm. Based on the results of the observation sheet and feedback questionnaire, the following data was obtained:

Table 4. Teacher Response Results

Assessment Aspects	Percentage Teacher Agrees	Information
The socialization material is easy to understand	95	Very good
Game applications relevant to Geography learning	93	Very Relevant
Teacher enthusiasm and participation during activities	90	Active
Teacher readiness to try out applications in the classroom	88	Tall
Applicability for use in schools	92	Worthy

Source: 2025 data analysis

Observations showed that teachers not only actively listened to the presentation but also directly tried playing games on their phones or laptops. Teachers were able to understand how features like earthquake disaster simulations, finding safe points, and evacuation scenarios worked in schools.

Qualitative Analysis

From the results of short interviews with five Geography teachers, several important findings were obtained:

a) Increased insight into digital learning media: Teachers who were previously unfamiliar with educational game media have become more aware of its potential to attract students' interest in learning.
b) Easy integration into the Geography curriculum: Teachers find the app usable on topics such as lithosphere dynamics, hydrosphere, and natural disaster mitigation.
c) Strengthening the role of teachers as facilitators: With the application, teachers play a greater role as guides in the exploration and reflection process, not just as providers of material.
d) Technical challenges: Some teachers mentioned the need for further training to become more familiar with managing technology-based activities in the classroom, as well as ensuring the availability of internet networks in schools.

In addition, participants assessed that disaster games help build digital literacy and disaster preparedness simultaneously, two important competencies in 21st-century learning. The following are photos of mentoring and evaluation activities for disaster game designs that have been made with geography teachers, including: (a) and (b) regarding discussions and introductions to teachers regarding disaster application designs (sekatebe.com).

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(a) (b)

Figure 10. Mentoring and Evaluation Activities

Based on observations and interviews, the disaster mitigation educational game received very positive responses from teachers, although several technical challenges remain, including varying levels of digital competence, limited internet stability, and differences in device performance. Additionally, teachers need to adjust their pedagogical approaches to effectively integrate the application into learning. To address these issues, follow-up actions include continuous training to improve digital literacy, optimizing the application for broader device compatibility, enhancing school infrastructure, especially internet access and providing user guidelines aligned with the Geography curriculum to support sustainable implementation and improve students' digital literacy and disaster preparedness.

Conclusion

The SEKATABE program has been proven to significantly improve disaster preparedness capacity at SMAN 6 Bengkulu City. The results of this community service project show a substantial increase in students' knowledge, from an average of 49.50% to 81.67%, along with improved evacuation behavior through physical simulations. The innovation in learning media, in the form of a web-based game (sekatebe.com), received positive responses from 90% of geography teachers and was considered a feasible and adaptive mitigation learning tool for Gen Z students. In addition to enhancing human resource capacity, this program also produced tangible outputs, including an evacuation route map and a school emergency response SOP document. The main limitation of this program was the instability of internet connectivity during simultaneous game access. Therefore, future community service initiatives are recommended to develop an offline application version. The sustainability of this program requires institutional commitment from the school to integrate SEKATABE simulations into the annual agenda, in order to maintain a lasting culture of disaster awareness.

Recommendation

Based on the findings, several key recommendations are proposed to strengthen the implementation and sustainability of the SEKATABE program. Disaster education should be systematically integrated into the geography curriculum and related subjects to foster consistent preparedness attitudes and behaviors among students, supported by regular training and simulations involving the entire school community in collaboration with local disaster management agencies. In addition, teacher capacity needs to be continuously enhanced through training in disaster education, digital media use, and simulation management to ensure effective application of SEKATABE. The game itself should be further developed by adding new features, varied scenarios, and offline access, while also being expanded to other disaster-prone schools. Strong institutional and policy support is essential, particularly in

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providing evacuation facilities, emergency equipment, and adequate infrastructure. Finally, further research with larger samples and longer-term designs is recommended to assess the sustained impact and effectiveness of digital-based disaster education.

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