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Training of Creating *Kamishibai* as Disaster Mitigation Education Media for Science Teachers

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ABSTRACT

Sukabumi is one of the areas prone to disasters. However, awareness of disasters among teachers and students is still low. Key issues at MGMP IPA Sukabumi include the need for innovative learning, the competency development of science teachers, interactive learning processes, and a comprehensive disaster mitigation curriculum. Training was conducted to overcome the last problem of developing disaster mitigation learning media. Activities include sending students to the Sakura Exchange Program, pre- and post-questionnaire administration on disaster awareness and risk reduction, mapping, and making Kamishibai at SMPN 1 Cikakak. Data collection using closed and open questionnaires to explore disaster awareness and risk reduction. The collected data were processed descriptively, qualitatively, and quantitatively. This training has succeeded in increasing disaster awareness among teachers and the community. This activity recommends ongoing disaster training and socialization to improve mitigation efforts. A contribution to the world of science education is to integrate disaster mitigation into the curriculum, increase the capacity of teachers as agents of change, strengthen community-based disaster mitigation education, and support the achievement of the SDGs.

ARTICLE INFORMATION

Keywords:
disaster awareness; disaster mitigation; disaster risk reduction; kamishibai

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INTRODUCTION

Indonesia is a disaster-prone country. According to the latest vulnerability mapping of Southeast Asia, the islands of Java in the West and East are vulnerable to the impacts of various geological or hydrometeorological disasters, such as earthquakes, tsunamis, volcanic eruptions, floods, landslides, droughts, and forest fires (Climate Change Knowledge Portal, 2021). One of the disaster-prone areas is Sukabumi, West Java. Floods and landslides occurred on December 3-4, 2024. The disaster resulted in 476 people evacuating due to damage to their homes and environment. In addition to flooding, areas in Sukabumi are also prone to tsunamis. According to Pramana (2015), the tsunami vulnerability category in Pelabuhan Ratu shows the categories of vulnerable (46%), quite vulnerable (19%), and very vulnerable (17%).

Disasters cannot be predicted in advance. Therefore, society requires disaster literacy. Disaster literacy is an effort to mitigate disasters so that people know about disasters and their potential (Labudasari & Rochmah, 2020; Kanbara et al., 2016; Vu et al., 2023). The importance of disaster literacy has been researched by Eskici et al. (2025) and Vu et al. (2023). The study results show that disaster literacy can significantly increase confidence and response skills, disaster awareness and preparedness, community understanding of mitigation and preparedness, and building a sustainable safety culture. Thus, society can prepare and know how to deal with disasters. Disaster literacy must

be applied early because children often become the victims. Mitigation is an effort to reduce or eliminate losses and victims due to natural disasters (Kumar et al., 2021). The disaster caused fatalities, serious and minor injuries, refugees, and damage to buildings and infrastructure. However, teachers and students still lack public awareness.

The number of children who are victims of disasters demands the government's efforts to provide adequate disaster education. This education is important for children and the school community, such as teachers, parents, and the community in disaster-prone areas. Early on, environmental education and disaster mitigation can reduce the negative impacts of disasters (Dikmenli et al., 2018). Schools play an important role in building children's resilience through integrated disaster preparedness education programs so that they can understand the risks and how to act when disasters occur. Therefore, comprehensive disaster education in school and community environments is essential to build a sustainable safety culture and reduce disaster risk.

The interviews with several teachers and people of Sukabumi found that the local government had implemented no mitigation education. As a result, when a disaster occurs, many people are affected. One of the locations affected by the disaster due to floods, landslides, and moving land in early December 2024 in Sukabumi is Cikakak. Therefore, a strategy is needed so that society knows and applies this knowledge when a disaster occurs. Mitigation education is needed so society remains calm and effectively manages emergencies during disasters (Ronan & Johnston, 2005; Shannon, 2015; Polcarová & Smetana, 2021). With disaster mitigation education, society remains calm and does not panic when a disaster suddenly occurs.

The discussion with the MGMP IPA (Science Teacher Association) in Sukabumi concluded that teachers had difficulty creating learning media for disaster mitigation education for junior high school students. One strategy can be implemented through disaster awareness or mitigation education to improve knowledge, behavior, and attitudes in environmental education and skills related to natural resources' positive and negative impacts. This needs to be done by teachers on the importance of disaster mitigation in learning by applying learning media that follows the subject matter and problems around students. Teachers must communicate disaster preparedness and risk reduction information and implement disaster drills (Ronan et al., 2015; Parrott et al., 2024).

Japan has implemented natural disaster awareness education from daycare to university level (Rachman et al., 2024). Regular training is provided in dealing with disasters and evacuation at every level of education. This effort is made because Japan is a disaster-prone country. One effort to increase awareness and reduce the risk of disasters is to use learning media in illustrated stories that teachers and students can make called *Kamishibai*. Kamishibai combines illustrations and storytelling. People who perform Kamishibai are called *Kamishibaiya*. Kamishibai uses illustrations to visualize the story, which can increase comprehension and appeal to audiences, especially children. Visualization can increase information retention (Mayer, 2009). Kamishibai often involves interaction, which can increase motivation and create a more meaningful learning experience. Dewey (1986) emphasized the importance of hands-on experience in learning, which can be achieved through storytelling techniques such as Kamishibai. Kamishibai has been commonly used in learning (Castro-Flores, 2019).

Sundawa et al. (2020) show that using the Kamishibai method in social learning in secondary schools can increase students' awareness and response to disaster risks. Thus, Kamishibai has the potential to increase public understanding of the steps that can be taken to reduce the impact of disasters. Learning with the Kamishibai method can provide a metaphor or local tradition as a picture, which can be adopted as the material for learning disaster mitigation (Atio, 2016) and increase students' knowledge of environmental education (Rachman et al., 2021). However, the Kamishibai method is more effective in elementary and junior high schools (Rachman et al., 2024; Paatela-Nieminen, 2008; Hernawan et al., 2021). Some of the results of these studies strengthen the validity

of Kamishibai as an evidence-based educational tool. Thus, Kamishibai not only enriches learning media but also contributes to developing disaster mitigation strategies that are more effective and adaptive to the local cultural context, as well as playing an important role in educational science and disaster risk management.

Making Kamishibai for science teachers of MGMP Sukabumi is very important, considering the effectiveness of this method in increasing disaster awareness and reducing disaster risk. Rachman et al. (2024) researched elementary school teachers in Mataram, showing that using Kamishibai and other innovative learning methods significantly improves students' understanding of disaster mitigation and critical thinking and decision-making skills in emergencies. The Kamishibai method, which combines pictorial stories and local traditions, also makes it easier to deliver complex material that is more engaging and easy to understand, especially for elementary and middle school students. The training activities at MGMP Sukabumi are expected to increase teachers' capacity and contribute to disaster risk reduction at the community level.

METHOD

The following are tools and materials to create Kamishibai: a knife or scissors (to cut the paper to the desired size); (2) a ruler (to measure and make straight lines on the paper); (3) a pencil or pen (to draw the initial sketch or mark the area to be cut); (4) drawing paper (to make the story); (5) watercolors or crayons (to color the picture on the story card); (6) colored markers or pens (to add details to the picture); and (7) clips or paper clips: to hold the story card in place when displayed.

This research uses quantitative and qualitative descriptive methods because this activity aims to measure teachers' disaster awareness and disaster risk reduction and explore teachers' understanding regarding efforts made when an earthquake occurs and how to prevent it**.** The data collection technique used was a questionnaire using Google Forms. The participants of the Kamishibai-making training are junior high school science teachers in Sukabumi. The participants who actively attended consisted of 17 teachers out of 20 people who had agreed. The stages of implementation are shown in Figure 1.

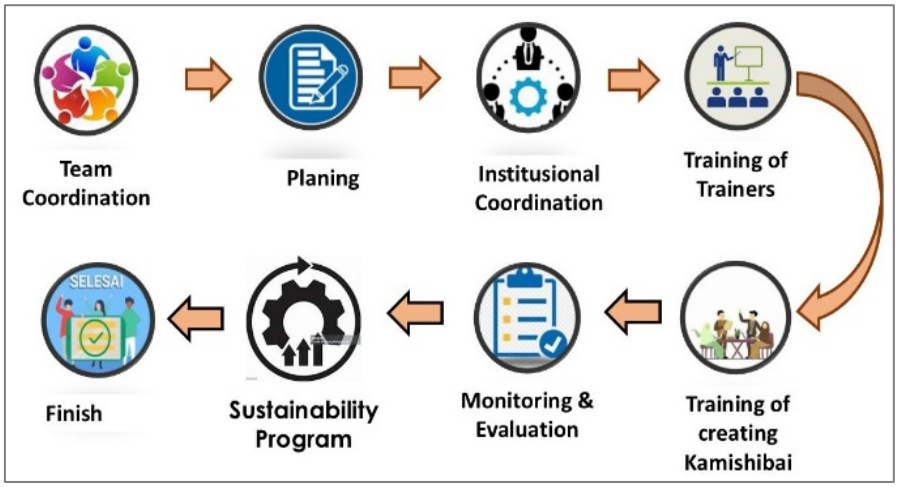

Figure 1. Stages of Community Service

Based on Figure 1, the stages of community service are carried out as follows: (1) Team Coordination. Initial coordination of the PKM team was carried out on Monday, November 11, 2024, and Tuesday, February 4, 2025. The things agreed upon included preparing students to participate in the Sakura Science Exchange Program, the schedule of activities, and the division of tasks for team

members; (2) Planning. The planning stage was carried out with the following activities: making a timeline and training schedule as a reference for the time of the implementers and participants during the training activities; Creating activity materials to make it easier for participants to understand the training materials; Purchasing tools and materials needed during the training activities; (3) Institutional Coordination and Admission. Coordination was made with the Sukabumi Education Office and Sukabumi MGMP IPA. Coordination was carried out online using Zoom Meeting. The meeting results were the following: 20 science teachers would participate in the activity, the online activity on February 20, 2025, and the offline activity was held on February 26-27, 2025, at SMP Negeri 1 Cikakak.

After the preparation, the next stage is the training activity, which begins with the Training of Trainers at Murae Laboratory. Two students participated in disaster mitigation training activities at the Fumitishi Murae Laboratory, University of Kitakyushu. The Fumitishi Murae Laboratory, University of Kitakyushu, fully funded the activity as a service partner. The next stage is Training and Application of Technology. The training began with a pretest followed by socialization or an explanation of the need for disaster mitigation and awareness for the school community by providing regular learning by the collaboration team from Kitakyusu University. The delivered materials were science learning media and Kamishibai as learning media for disaster mitigation. Small groups were formed to explore disaster-prone areas around the school. The exploration results were mapped and presented at the beginning of the Kamishibai-making activity at SMP Negeri 1 Cikakak, Sukabumi Regency. Kamishibai was made individually and presented.

Two students who have received training in Japan facilitated the offline making of Kamishibai at SMPN 1 Cikakak. The activity began with a brief presentation about Kamishibai and examples. The technique of making Kamishibai began with drafting scenarios and narratives to produce Kamishibai with the theme "Disaster Mitigation." A narrative can be a story that describes how to reduce risk, impact, and disaster management in the vicinity. Based on the draft, participants were allowed to develop their creative ideas to produce an attractive Kamishibai that contained an invitation so that there would be no loss of life and severe damage during disasters. Upon completion, several participants presented their innovative works.

The final stage of the activity is evaluation. Evaluation was carried out to determine the success of the program. Knowledge evaluation was carried out using an awareness mitigation test instrument. Evaluation was also carried out during the activity, and the resulting product was Kamishibai mitigation. The program sustainability is Kamishibai by teachers and will be produced into a book by the PKM Team. Teachers would receive the produced book in print or digital form and apply it in learning in their respective schools and share knowledge and skills with their colleagues. Thus, the Sukabumi community's disaster awareness is increasing to reduce disaster risk.

RESULTS AND DISCUSSION

Sakura Science Exchange Program was held on February 10–16, 2025, at the Fumitoshi Murae Laboratory, University of Kitakyushu. Participants came from several regions in Indonesia, including elementary school teachers, lecturers, and students from Universitas Pasundan, Universitas Negeri Malang, and Universitas Pakuan. The Sakura Program Exchange in Science was fully funded by the Japan Science and Technology Agency (JST). Two student representatives were sent to receive the training. The activity implemented the collaboration between Universitas Pakuan and the University of Kitakyushu through the International Collaborative Community Service Grant.

The activity of the Sakura Program Exchange began on February 10, 2025. The first day was an orientation program at the Kyushu Center, Kitakyushu. Participants were introduced to the program's objectives, activity schedule, and life guide in Japan. Afterward, participants visited the Space

Laboratory, where various natural disasters were introduced. On the second day, participants visited The University of Kitakyushu Kitagata Campus to learn about their role in dealing with disasters. The activity continued with *Machiaruki* and mapping activities in the environment around the University of Kitakyushu. On the third day, seminar activities at Murae Lab and JICA (Japan International Cooperation Agency) focused on emergency bags and Kamishibai-making techniques regarding disasters or disaster campaigns. On the fourth day, participants visited Aobadai Elementary School and saw how the school implements disaster education. This activity provides direct insight into how disaster mitigation procedures are implemented in school environments in Japan. After that, participants visited the Fujinoki Community Center to find out how the Community Center plays a role as a place of refuge. The activity was then finished with a visit to the Kitakyushu Department of Education to learn about disaster education. On the fifth day, participants tried to feel the earthquake and listened to a public lecture from the disaster department of the Kitakyushu Regional Government. Participants also learned about the role of local governments when disasters occur. The peak activity took place on February 15, 2025. Participants presented their learning outcomes and disaster mitigation action plans at the Murae Laboratory, University of Kitakyushu. The activity ended on February 16, 2025.

Participants who return to Indonesia bring new experiences and knowledge gained during the Sakura Science Exchange Program, which can significantly increase students' capacity to implement innovative and science-based learning methods in their respective schools. Research shows that strengthening teacher capacity through international training and knowledge exchange can increase the effectiveness of disaster mitigation education in schools in disaster-prone areas (Charles & Fievre, 2021; Cvetković et al., 2024). Thus, collaboration between international exchange programs and local teacher networks such as MGMP Science not only enriches the quality of science education but also strengthens the preparedness of school communities in the face of disaster risks, which is critical for the sustainability of education in disaster-prone areas (Samad et al., 2025).

This activity aims to increase educators' and community's awareness and understanding of disaster mitigation. It is attended by 234 people, including lecturers, teachers, and students concerned with disaster mitigation education. This webinar is an important event for sharing knowledge and strategies. Participants receive benefits through open-access presentation materials and electronic certificates as a sign of their participation. These benefits not only serve as learning resources that are easily accessible at any time but also as a form of formal recognition for their involvement in the program. Open access to learning materials has increased teachers' motivation and professional development by providing flexible and sustainable learning resources (Olszewski & Crompton, 2020). This is important so educators can convey effective and accurate information to students and the wider community, thereby increasing community preparedness and resilience to disasters (Al-Amin et al., 2019; Cvetković et al., 2024).

This webinar is a positive step in increasing disaster awareness and risk reduction in the educational environment. Through collaboration between universities and educational institutions, it is hoped that a generation will be created that is more prepared to face disasters and able to contribute to disaster mitigation efforts in the community. Thus, this event provides new insights and strengthens the cooperation network between institutions facing future disaster challenges. By leveraging the collaborative efforts between universities and other educational bodies, the webinar facilitates the integration of up-to-date scientific knowledge, practical skills, and community-based approaches into disaster education curricula.

The exploration was carried out by students on Wednesday, February 27, 2025, around SMPN 1 Cikakak. Interviews were conducted with local people and RT chairpersons. Exploration and mapping are critical in identifying and delineating disaster-prone areas, which is fundamental for

effective disaster risk reduction and management. Incorporating local knowledge and community-based participatory mapping enhances the accuracy and relevance of risk maps by capturing localized vulnerabilities and hazard perceptions that may not be evident from remote sensing data alone (Chambers et al., 2022). This participatory approach fosters community engagement and ownership, essential for successfully implementing mitigation strategies. The exploration results are then mapped, as shown in Figure 2.

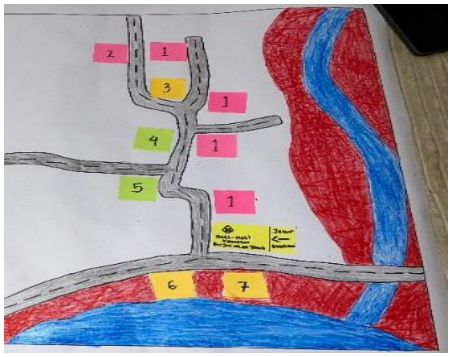

Figure 2. Mapping of disaster-prone locations around SMP Negeri 1 Cikakak

Figure 2 shows that there are several danger points that the public must be aware of. The public should not approach the place. By knowing these vulnerable locations, people can avoid high-risk areas, thereby reducing the possibility of casualties and material losses when a disaster occurs. The community around SMPN 1 Cikakak also needs to know a safe place as an evacuation site in the event of a disaster. Schools as community centers have a strategic role in disseminating disaster mitigation information and organizing evacuation simulations so students and residents can act quickly and appropriately when disasters occur.

The training was conducted at SMPN 1 Cikakak on Thursday, February 27, 2025. This training is a follow-up to the Sakura Science Exchange Program and the previous Webinar. Before the training, material about Kamishibai and some examples were presented. Participants must first complete a draft with narration to make Kamishibai. The next step is to draw on drawing paper. The PKM Team provides all drawing equipment. Several teachers struggled to express their ideas and imaginations when making drafts and narrations. However, not long after, the teachers started to have fun improvising and making drafts and sketches. When the sketch was ready, the resulting image was sketched to make it more eye-catching. The resulting Kamishibai is presented (Figure 3).



Figure 3. Participants with their Kamishibai products

Similar training was also conducted in elementary schools in Mataram. The activity results showed increased teachers' abilities and skills in teaching about disasters (Rachman et al., 2024). Teachers need to know about disasters because it relates to their understanding of environmental sustainability education (Hernawan et al., 2021). Before and after the activities, data was collected using a disaster awareness and disaster risk reduction questionnaire. The questionnaire contained several closed and open-ended questions. The results of the closed-ended questions are presented in Table 1.

Table 1. Results of the Disaster Awareness and Disaster Risk Reduction Questionnaire

Question	Pre	Post
Have you ever experienced a disaster?		
a. Yes	64.7	64.7
b. No	35.3	35.3
How prepared are you to face a situation if a disaster occurs?		
a. Not Prepared	23.5	0
b. Less Prepared	52.9	29.7
c. Prepared	23.5	70.6
d. Very Prepared	0	0
What percentage is your confidence that you will be safe if a disaster occurs?		
0 to 20%	35.3	0
21 to 40%	11.8	0
41 to 60%	35.3	0
61 to 80%	17.6	70.6
81 to 100%	0	29.4
What will you do when a disaster suddenly occurs?		
Seek a safe place	29.4	41.2
Do not know what to do	35.3	0
Stay calm	23.5	35.3
Save yourself	11.8	23.5
In your opinion, is disaster education necessary?		
a. Not necessary	0	0
b. Necessary	100	100
In your opinion, how important is it to know the surroundings of your home and school?		
Not important	0	0
Less Important	0	0
Important	11.8	5.9
Very Important	88.2	94.1
Have you ever mapped the surroundings of where you teach?		
Yes	47.1	82.4
No	52.9	17.6
Have you ever heard of the term "Kamishibai" Japanese theater paper?		
Yes	17.6	100
No	82.4	0
Do you know the function of Kamishibai in disaster education?		
Yes	17.6	100
No	82.4	0

Table 1 shows: (1) The level of community preparedness increased from 23.5% to 70.6%; (2) An increase in confidence that they will be safe if a disaster occurs from 17.6% to 100%; (3) An increase in awareness during a disaster from 64.7% to 100%; (4) An increase in the importance of knowing the surroundings from 88.2% to 94.1%; (5) An increase in having conducted mapping from 47.1% to 82.4%; (6) An increase in having heard the term "Kamishibai" Japanese theater paper from 17.6% to 100%; and (7) An increase in understanding the function of Kamishibai from 17.6% to 100%. These increases are due to teachers understanding the importance of disaster awareness in reducing the risk of disasters. The results of the five open-ended questions are presented in Table 2.

Table 2. Disaster Preparedness

Question	Conclusion Answer
What should be prepared when a disaster occurs?	Prepare an emergency bag, food, and medicine; change clothes for 2 or 3 days, flashlight, and tissue; stay calm. Bring a prepared disaster preparedness bag and go to a safe place.
What should be brought when evacuating after a disaster?	When evacuating, Things must be brought: clothes, valuables (money, gold, important documents), medicine, food, drinks, power banks, flashlights, clothes, communication devices, and an emergency bag.
What will you do if an earthquake occurs?	During an earthquake, stay calm and take measured actions to protect vital body parts such as the head; find a safe place under the table or corner of the room. After an earthquake, evacuate carefully by bringing important documents and keep your family safe.
What will you do if a landslide occurs?	Run and save themselves in an open area to avoid landslides when a landslide occurs. Help your family and neighbors.
What will you do if a flood occurs?	When flooded, move to a higher place, immediately protect yourself and your valuables, and help your family and neighbors.

Based on the answers in the Community Service activities, it can be concluded that people are aware of and know what to do if a disaster occurs at any time. They also understand the need to carry out activities to reduce the disaster risk. Communities can better participate in risk assessment and early warning systems to reduce the impact of disasters at the local level (Mead, 2022). Community participation in the risk assessment process allows for more accurate identification of local vulnerabilities and capacities so mitigation strategies can be tailored to the specific needs of those communities. In addition, an early warning system that directly involves the community is also expected to improve rapid response and preparedness, ultimately reducing life and mortality.

CONCLUSION

The stages implemented in community service activities at MGMP IPA Sukabumi are sending two students to participate in the Sakura Science Exchange Program, providing a pretest of disaster awareness and disaster risk reduction, mapping, creating Kamishibai at SMP Negeri 1 Cikakak, and providing a posttest of disaster awareness and disaster risk reduction. This activity has increased public awareness of disasters and disaster risk reduction. This awareness is essential for teachers and the community because Cikakak is a disaster-prone area. The activity had limited participants, requiring creativity and skills in conveying messages through stories. Several recommendations regarding disaster mitigation, besides those through Kamishibai, include continuous disaster training

and disaster mitigation socialization. The produced Kamishibai can be made into a printed or digital book to widen its use.

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