Improving the awareness of earthquake natural disasters preparedness of SMP Muhammadiyah Sewon students

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Abstract. Indonesia is a country with a large population, with geographical conditions traversed by confluence of earth's plates that are actively moving, so that the area is prone to disasters. With these natural disasters, residents must be prepared for various kinds of disasters in order to save lives and minimize material losses and casualties. The level of preparedness for natural disasters should be instilled from the earliest possible age. One of the Muhammadiyah schools that is being reviewed in this service proposal is Muhammadiyah Middle School Sewon Bantul. This junior high school is located in Bandung Kulon, Pendowoharjo, Sewon, Bantul, Special Region of Yogyakarta. Looking historically, the Special Province of Yogyakarta is one of the areas in Indonesia which is prone to natural disasters such as earthquakes, exposure to volcanic ash from Mount Merapi, and cold lava. This school has general junior high school grade levels, namely grades seven, eight, and nine. From preliminary surveys and personal communications made to school administrators, it is known that there is no information and planning regarding natural disaster preparedness, and infrastructure related to evacuation routes and gathering points in the event of a natural disaster such as an earthquake. Departing from the problems found and described above, it is deemed necessary to carry out community service at the school in relation to mapping the existing conditions of spatial functions, planning evacuation routes and assembly points, as well as outreach regarding disaster preparedness. It is hoped that with this community service, students can better understand and be aware of the importance of being prepared for natural disasters such as earthquakes, not causing panic, and reducing the risks of losses that can result from natural disasters. In the long term, it is hoped that with optimal assistance, teachers can guide students so they can be more prepared for natural disasters such as earthquakes and furthermore, insert in the subjects taught to junior high school students related to natural disaster preparedness.

Keywords: evacuation route, disaster mitigation, junior high school, disaster preparedness education

1 Introduction

Increasing awareness of natural disasters, particularly earthquakes, among students and teachers in schools is crucial for ensuring the safety and preparedness of the school community. Several studies have emphasized the need to enhance disaster prevention education strategies in school curricula [1–3]. These strategies include focusing on students' perception and teachers' performance in disaster prevention education [4], planning...
professional teacher-training programs for disaster prevention education [3], and assessing educational methods for improving children's awareness of natural disasters [5]. Furthermore, the role of geography teachers in enhancing earthquake and tsunami disaster preparedness among students has been highlighted [6], along with the readiness of geography teachers to use mobile devices in the teaching process [7]. It is evident that the awareness and preparedness of students and teachers play a significant role in mitigating the impact of natural disasters. Studies have also examined the earthquake awareness levels of undergraduate students [8] and identified geography teacher competency in disaster literacy [9]. Additionally, disaster education initiatives for elementary school students have been explored, including the use of disaster prevention pocket notebooks and quizzes [10]. In conclusion, the literature underscores the importance of integrating comprehensive disaster prevention education into school curricula, enhancing teacher training programs, and utilizing innovative educational methods to increase awareness of natural disasters, particularly earthquakes, among students and teachers. By incorporating these findings into educational policies and practices, schools can effectively contribute to the safety and preparedness of their communities.

To increase the understanding of earthquakes for junior high school students, it is essential to consider educational programs and initiatives that have been developed to enhance earthquake awareness and preparedness among students. One study focused on the knowledge and perception of secondary school students in Belgrade about earthquakes as natural disasters, shedding light on the importance of understanding students' perspectives and awareness levels [11]. Additionally, a study in Nepal highlighted the impact of public school earthquake safety programs in increasing the seismic safety of the entire community, emphasizing the broader community benefits of such initiatives [12]. Furthermore, research on earthquake disaster preparedness for junior high school students demonstrated the positive impact of educational interventions on students' knowledge and preparedness for earthquake natural disasters [13]. Moreover, the development and evaluation of science and technology education programs using advanced technologies such as interferometric synthetic aperture radar (SAR) have been proposed to teach junior high school students to measure terrain changes, offering innovative approaches to engage students in understanding earthquake-related phenomena [14]. Additionally, the implementation of earthquake awareness initiatives in schools, such as the 'Situated Learning Episode' under the KnowRISK project, has been highlighted as highly feasible for assessing progress in cognizant learning and adaptability, emphasizing the effectiveness of structured educational interventions [15]. Furthermore, the design of earthquake-resilient classroom furniture, such as earthquake-resilient classroom tables, has been proposed to provide students with effective means to protect and prepare themselves for natural disasters, emphasizing the importance of creating a safe learning environment for students. These references collectively provide valuable insights into educational programs, innovative teaching methods, and community-focused initiatives that can contribute to increasing the understanding of earthquakes for junior high school students.

In the context of increasing awareness of earthquakes for schools in the Indonesia region, it is crucial to consider the specific geographical and social factors that influence disaster preparedness and education. Several studies and initiatives provide valuable insights into earthquake awareness and preparedness in Indonesia and similar regions, shedding light on the importance of tailored educational programs and community-focused initiatives. One study examined the impact of retrofitting work on awareness raising and knowledge transfer in Aceh Province, Indonesia, emphasizing the vulnerability of buildings constructed after the 2004 earthquake and tsunami disaster [16]. Additionally, the preparedness level of the school community in handling earthquake and tsunami threats in Banda Aceh City was assessed, highlighting the region's susceptibility to active fault lines.
such as the Sumatran Fault [17]. These references underscore the significance of understanding the specific risks and vulnerabilities in the Indonesia region to effectively tailor earthquake awareness and preparedness initiatives for schools. Furthermore, disaster mitigation through comic moral dilemmas for elementary school students was proposed as a means to enhance early disaster awareness education in Indonesia, emphasizing the need to minimize the impact of disasters through targeted educational approaches [18]. Additionally, a study on earthquake disaster preparedness for students of junior high school in Indonesia highlighted the importance of previous research journals related to students' awareness of earthquake disaster preparedness, emphasizing the existing knowledge base that can inform educational interventions [13]. Moreover, the role of public education and awareness in tsunami hazard management was discussed in the context of Indonesia, emphasizing the impact of public education and awareness on disaster management and response [19]. This highlights the importance of comprehensive disaster education programs that encompass earthquake and tsunami hazards in the region.

The level of preparedness for natural disasters should be instilled from as early an age as possible. At the Muhammadiyah organizational level, there are institutions that focus on covering various activities related to natural disasters, such as MDMC (Muhammadiyah Disaster Management Center) which was initiated in 2007 by the Muhammadiyah Central Leadership. Many of Muhammadiyah's charity businesses are public facilities such as hospitals, schools, Islamic boarding schools, universities, and even orphanages, creating a challenge to provide disaster preparedness education as early as possible to everyone involved in every Muhammadiyah charity business.

One of the Muhammadiyah schools that is being reviewed in this service proposal is Muhammadiyah Middle School Sewon Bantul. This junior high school is located in Bandung K Roller, Pendowoharjo, Sewon. Bantul, Special Region of Yogyakarta. Looking historically, Yogyakarta Special Region Province is one of the regions in Indonesia that is prone to natural disasters such as earthquakes, exposure to volcanic ash from Mount Merapi, and cold lava. This school has general junior high school class levels, namely grades seven, eight and nine. From preliminary monitoring (preliminary survey) and personal communications made to school administrators, it is known that there is no information and planning regarding preparedness for natural disasters, and facilities and infrastructure related to evacuation routes and gathering points in the event of a natural disaster such as an earthquake.

Based on the problems found and described above, community service is deemed necessary to be carried out at the school in relation to mapping the existing conditions of space functions, planning evacuation routes and gathering points, as well as outreach regarding disaster preparedness. It is hoped that with this community service, students will be able to better understand and be aware of the importance of being prepared for natural disasters such as earthquakes, not causing panic, and reducing the risks of losses that can arise from natural disasters. In the long term, it is hoped that with optimal assistance, teachers can guide students to be more prepared for natural disasters such as earthquakes and, furthermore, include subjects taught to junior high school students related to natural disaster preparedness.

2 Methodology

2.1 Surveys

Figure 1 illustrates the comprehensive approach taken in this initiative, combining a structured survey and effective communication with the school's headmaster. The activity involves a thorough examination of Muhammadiyah Sewon Bantul's junior high school,
conducted through both on-site and offsite surveys. Through meticulous checking and direct communication channels with the headmaster, this survey aims to gather essential insights into the school's existing emergency preparedness measures. This holistic approach ensures a well-rounded understanding of the current state of evacuation routes and safety protocols, paving the way for targeted improvements and the successful implementation of the project.

**Figure 1.** Communication established from the team to the school’s headmaster.

### 2.2 Presentation to Stakeholders

The team played a pivotal role in presenting and persuading students to heighten their awareness of earthquake disasters. Through engaging presentations and persuasive communication strategies, the team effectively conveyed the importance of being prepared for such emergencies. The efforts aimed to instill a sense of urgency and responsibility among the students at Muhammadiyah Sewon Bantul, emphasizing the significance of earthquake preparedness. By fostering a deeper understanding of the potential risks and the importance of proactive measures, the team contributed significantly to the collective awareness of the student body, empowering them to take the necessary steps for their safety and well-being in the face of potential earthquake disasters.

### 3 Result and Discussions

#### 3.1 Implementing signings for stairs to increase disaster awareness

Figure 2 captures a pivotal aspect of our initiative, showcasing a person installing signage on stairs to enhance students' awareness and caution during disasters, particularly earthquakes. This visual representation exemplifies the proactive measures taken to create a safer environment within Muhammadiyah Sewon Bantul's junior high school. By strategically placing these signs, the team aims to cultivate a heightened sense of alertness among students, encouraging them to navigate stairs carefully and efficiently during emergency situations. The installation of these visual cues serves as a tangible demonstration of our commitment to fostering a culture of safety and preparedness, ensuring that every step taken by the students is a step towards a secure and well-prepared school community.
**3.2 Presentation using Mock Up Building subjected to earthquakes**

In Figure 3, the team is depicted utilizing a mock-up tool to simulate earthquake scenarios in various heights of buildings. This hands-on demonstration adds a dynamic dimension to our initiative, providing students at Muhammadiyah Sewon Bantul's junior high school with a tangible and visual understanding of the potential impact of earthquakes on different structures. By employing this mock-up tool, the team engages students in an immersive learning experience, allowing them to witness firsthand the importance of evacuation routes and the significance of staying vigilant during seismic events. This innovative approach not only enhances comprehension but also reinforces the practical aspects of earthquake preparedness, empowering students with the knowledge and skills needed to respond effectively in real-life situations.

**3.3 Result of Pre- and Post-Test Questionnaires**

The pre-test outcomes reveal the students' initial knowledge levels prior to the presentation, while the post-test results indicate a notable enhancement in understanding concerning awareness of natural disaster earthquakes following the presentation. Table 1 provides clear evidence of this knowledge improvement, demonstrated by a rise in the number of correct responses to the questions posed.

Table 1. Result of Pre-Test and Post-Test to the students and teachers about the evacuation routes.

<table>
<thead>
<tr>
<th>Question 1. Do you know what is the earthquake?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Answer 1.</strong></td>
</tr>
<tr>
<td>- Less understand</td>
</tr>
<tr>
<td>- Understood</td>
</tr>
<tr>
<td>- Understand enough</td>
</tr>
<tr>
<td>- Very understood</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-test (Before demonstrations)</th>
<th>Post-test (After demonstrations)</th>
</tr>
</thead>
<tbody>
<tr>
<td>36.8%</td>
<td>31.6%</td>
</tr>
<tr>
<td>26.3%</td>
<td>25%</td>
</tr>
<tr>
<td>31.6%</td>
<td>25%</td>
</tr>
<tr>
<td>12.5%</td>
<td>25%</td>
</tr>
<tr>
<td>25%</td>
<td>25%</td>
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</tbody>
</table>

**Figure 2.** One team member installed the signing on the stairs and **Figure 3.** One team member engage to the students to increase the disaster awareness.
Pre-test (Before demonstrations) | Post-test (After demonstrations)
--- | ---
**Question 2.** How should we behave when an earthquake occurs?
Answer 2.  
- **Do nothing:** 92.1%  
- **Scream:** 7.9%  
- **Panic:** 0%  
- **Calm and be aware:** 0%

**Question 3.** What causes earthquakes?
Answer 3.  
- **Movement of earth elements in the earth:** 50%  
- **Movement of the layers of the earth's crust:** 12.5%  
- **Movement of clay in the earth:** 12.5%  
- **The movement of water flows in the earth:** 37.5%  
- **Others:** 0%

**Question 4.** Which of the following is not an impact of an earthquake is...?
Answer 4.  
- **Soil fertility:** 78.9%  
- **Transportation access is cut off:** 7.9%  
- **Collapse of buildings:** 12.5%  
- **Disruption of flight paths:** 0%
4 Conclusions

In summary, the successful execution of the initiative to enhance awareness of earthquake disasters among junior high school students at Muhammadiyah Sewon, Bantul, is evident in the favorable outcomes attained. The project's achievements underscore the effectiveness of our inventive approach, not only in imparting vital life-saving skills but also in cultivating an interactive and efficient learning atmosphere for the students. The notable results highlight the positive influence of innovative educational methods on students' comprehension and retention of crucial information. Going forward, it is imperative to capitalize on these accomplishments by continuously refining and expanding initiatives that concurrently promote learning and safety within the school community. Particularly noteworthy was the students' sustained high levels of attention during the presentations, underscoring the success of our engaging instructional strategies.

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References