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Enhancing Student Preparedness and School Safety Through Disaster Simulation: A Comprehensive Analysis and Policy Implications

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A R T I C L E I N F O

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A B S T R A C T

Disaster simulation in schools has become an increasingly important aspect of efforts to improve student preparedness and safety in various countries. This article explains the importance of disaster simulation as an effective tool for preparing students to face various natural disasters and emergency incidents in the school environment. This simulation method has been proven to increase students' understanding of the actions to be taken during emergency situations, as well as providing opportunities to identify potential risks and weaknesses in school emergency plans. The methodology used in this article includes literature analysis, case studies, and a review of disaster simulation programs that have been implemented in various schools. The research results show that disaster simulations are effective in increasing student preparedness and reducing the potential negative impacts of disasters in the school environment. The discussion includes the benefits, challenges, and policy implications of using disaster simulations in schools. The conclusion of this article is that disaster simulation is an important investment in student safety and preparedness, and needs to continue to be improved in educational contexts.

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INTRODUCTION

Indonesia is a country that is vulnerable to natural disasters. The National Disaster Management Agency (BNPB) reported that 1,945 natural disasters occurred in Indonesia throughout 2022, As of July 2 2022 The natural disasters that dominate are extreme weather, floods and landslides. In detail, flood disasters occurred 756 times, landslides 377 times, extreme weather 694 times. Meanwhile, earthquakes occurred 12 times, forest and land fires 94 times and tidal waves and abrasion 11 times. From the impact of this natural disaster, 104 people died, 15 people were missing, 692 people were injured and 2,433,952 people were affected and displaced (BNPB:2022).

Sendai Framework for Disaster Risk Reduction (Sendai Framework for Disaster Risk Reduction) 2015-2030 prioritizes disaster risk reduction efforts with a focus on human aspects, namely reducing vulnerability and improving capacity. The emphasis of disaster risk reduction efforts, as highlighted in the Sendai Framework (2015-2030), is on addressing human aspects, specifically reducing vulnerability and enhancing capacity. Therefore, our primary focus should be on strategies and actions aimed at making people and communities less vulnerable to disasters by improving their preparedness, knowledge, and resilience. This involves implementing measures such as educating communities, strengthening infrastructure, raising awareness, and involving everyone in disaster preparedness and response, ultimately working towards a safer and more resilient society.

Children are also at risk and easy to suffer from disasters because they spend much of their time in the school environment. The safety of children at school has, therefore, become a global priority. Hyogo Framework Action (2005–2015) urge countries to ensure school safety for children. Therefore, school authorities need to have a comprehensive disaster risk management strategies to manage catastrophes and their associated risks in schools (Shah:2020). Natural disasters and emergency incidents can occur without warning, and schools are one environment where students and staff must be prepared to deal with them. The increasing frequency and impact of natural disasters such as earthquakes, floods, storms and fires have made us aware of the importance of preparing students effectively. One way that has been found to be effective in increasing student preparedness and safety is by holding disaster simulations in schools.

Disaster simulation is a method designed to simulate emergency situations that may occur in schools, such as earthquakes or fires, so that students and staff can practice the actions to be taken in those situations. In this article, we will discuss the importance of disaster simulation as a tool to increase student preparedness and reduce the potential risk of disasters in schools.

METHODS

This research methodology involves several stages, including literature analysis, case studies, and a review of disaster simulation programs that have been implemented in various schools. We will also analyze data from several countries that have integrated disaster simulation into their school curricula.

1. Literature Analysis: We conducted a literature search involving studies on the effectiveness of disaster simulations in increasing student preparedness and reducing risks in schools. We examined relevant scientific articles, books, and research reports.
2. Case Study: We collected data from several schools that have implemented disaster simulation programs successfully. We conducted interviews with students, school staff, and experts to gain a deeper understanding of the benefits and challenges of this program.
3. Overview of Disaster Simulation Programs: We analyze disaster simulation programs that have been implemented in various countries, including the methods used, objectives, and results achieved.

RESULTS

The results of this research show that disaster simulation has many benefits in improving students' preparedness and safety at school. Some of the main benefits found include:

1. Increased Understanding: Disaster simulations help students understand the actions to be taken during emergency situations. They learn how to avoid danger and protect themselves and others.

   For example, in Daud's 2014 research, earthquake disaster preparedness increases with increasing knowledge about earthquakes, more appropriate attitudes towards earthquakes and more appropriate actions in dealing with earthquakes. In Afandi 2014 research, results showed that simulation training was proven to increase students' knowledge about earthquake disaster mitigation from 20 to 28%. In Setyaningrum's 2020 research, results show that the simulation method is effective in increasing students' knowledge. The average student knowledge about earthquakes increased to 76.72 after receiving disaster education. In fact, before receiving earthquake disaster education, the average student knowledge score was only 35.78. In Mirza's 2023 research, Disaster literacy counseling using reading, discussion and practice methods can increase the presentation of knowledge about earthquakes from 65.6% to 88% while attitudes towards earthquake emergency conditions from 68.4% to 84% and engagement in evacuation practices from 42.8 % to 90%.

   Overall, disaster simulations are valuable tools for both education and preparedness. They help individuals develop the knowledge, skills, and mindset necessary to respond effectively to emergency situations, potentially saving lives and reducing the impact of disasters.

2. Identify Potential Risks: Disaster simulations provide an opportunity to identify potential risks and weaknesses in school emergency plans.

   Simulations play a crucial role in many countries by providing a valuable opportunity to identify potential risks and weaknesses in school emergency plans. These simulations involve mock emergency scenarios, where students, teachers, and school staff practice how to respond in the event of various emergencies like fires, earthquakes, or lockdown situations. Madagascar in which simulation exercises are used to assess levels of student understanding, Nicaragua in which observations of skills and behavior are used to determine student progress towards acquiring a culture of prevention, and, potentially, Lesotho in which skills-oriented forms of assessment have been promised under the new national curriculum (Selby: 2012).

   Evacuation simulations serve as a practical tool for students to rehearse their emergency response actions and enhance their abilities in managing emergency scenarios. Within these simulation exercises, students have the opportunity to familiarize themselves with proper evacuation guidelines and protocols, appreciating the significance of prompt and composed action in times of emergency. Beyond their role as an educational approach, simulations can also serve as a means to assess students' performance in responding to disaster situations (Mirza:2023).

   Disaster simulations are valuable for identifying potential risks and weaknesses in school emergency plans. These simulations create a controlled environment where various emergency scenarios can be enacted, allowing school authorities, staff, and students to assess the effectiveness of their plans. By observing how participants respond and interact during these simulations, potential vulnerabilities and areas for improvement can be identified. This proactive approach enables schools to make necessary adjustments to their emergency plans and enhance their preparedness for real-life crises, ultimately ensuring the safety and well-being of everyone in the school community.
3. Reduction of Fear and Anxiety: Students who have participated in a disaster simulation tend to be more calm and confident if they actually face a disaster at school.

   For example, the Japanese government, learning about disaster mitigation has long been one of the learning materials in its schools, so that most of its citizens are prepared and able to reduce the risk of disasters such as large earthquakes and tsunamis. Likewise, in Kindergarten schools, they are also used to receiving earthquake simulation training materials. Starting from getting special hats prepared by the school, taking cover behind tables, to instead of panicking, they were trained to behave calmly and line up in an orderly manner. Likewise, at advanced schools, the knowledge and insight into disaster that has been instilled since childhood has become a guide and has even become the instinct of every individual (Gunarba in Sair:2019). If this example is taken in the Indonesian context, it must be admitted that the

practice of disaster simulation in Indonesia is still very sporadic, and is often even carried out as a ceremonial event. What's worse, drills are only carried out if a disaster has occurred. This condition is certainly very unfortunate (if not called embarrassing). Therefore, it is time for the government to implement a disaster curriculum in schools in order to save the lives of Indonesian people in the future. The curriculum must be formulated in a good way and positioned as Education for Sustainable Development through established principles. An established curriculum must of course be built with established principles, such as; relevance, effectiveness, efficiency and flexibility (Sair:2019)

4. Community Engagement: Disaster simulations can also involve local communities in efforts to improve preparedness.

   According to Twigg John in his book Characteristics of A Disaster Resilient Community (2007), this community also has special characteristics, such as; (1) has the capacity to absorb stress or destructive forces through resistance or adaptation, (2) has the capacity to manage or maintain certain basic functions and structures, during catastrophic events, and (3) have the capacity to recover or retrain after experiencing a disaster.

   The concept of disaster education and literacy can be explained based on the Tri Center for Education framework initiated by Ki Hajar Dewantara. Through this framework, disaster education and literacy can be applied to the family environment, school environment and community environment. In the family environment, disaster education and literacy is emphasized on the affective aspect. Aspects of disaster education and literacy at the school level can be material or cognitive (knowledge) or skills (psychomotor).Disaster education and literacy in the community is carried out by transferring knowledge that has been gained in the family and school environment to society in general through social activities. Disaster literacy in the community can be realized through installing and socializing disaster signs or warning boards regarding the threat of disasters in the community (Prakoso:2017).

To improve disaster preparedness and response, simulation exercises have been applied to capacitate and improve emergency responders' skills, assess the organization's current disaster response plans, and establish linkage with different organizations (Gundran:2023)

Apart from these benefits, disaster simulations can also help in developing students' social skills. They learn to work together in stressful situations, which helps them develop skills such as communication, leadership, and teamwork.

DISCUSSION

Although disaster simulation has significant benefits, there are several challenges that need to be overcome in implementing it effectively in schools. Key challenges include allocation of sufficient resources, careful planning, selection of competent instructors, and measuring program effectiveness. In some cases, schools may experience budget and time constraints to implement comprehensive disaster simulations.

1. Allocation of Sufficient Resources: One of the main challenges in carrying out disaster simulations is the allocation of sufficient resources. This includes funds for procurement of simulation equipment, instructor training, and other operational costs. Schools often struggle to find adequate budgets for these programs. One of the inhibiting factors in implementing disaster mitigation programs through disaster preparedness schools is a lack of funds to carry out disaster mitigation activities and availability of infrastructure related to disaster preparedness has not yet met all school members. (Apriyanti:2019, Qoriandani:2020).
2. Careful Planning: Effective disaster simulation requires careful planning. This includes selecting the type of simulation appropriate to the potential risks in the school area and designing realistic scenarios. Lack of good planning can reduce the effectiveness of the program.

   Disaster management action plans need to be further developed to prevent panic when facing the danger of a disaster. Even though the socialization of disaster prepared schools (SSB) and the 1 million safe schools and hospitals campaign have been launched, the survey results show that school preparedness planning is the result of the work of parties outside the school, such as the government and other institutions. Because the SSB initiative has not been carried out by the school itself, procedures and information about disaster preparedness are only stored documents and the school itself has not created an environment that is safe from disaster hazards (Lesmana:2015)

   T School in the city of Bogor once carried out an emergency or disaster response simulation. The emergency or disaster response simulation program at school T is a school organization (committee) program because the school does not yet have a special emergency response organization. Several activities related to emergency response have been carried out, such as disaster simulations and medical emergency response, most of which were obtained through scouting/ SCOUT training (Ginanjar:2020).

   The absence of an in-school organization dedicated to disaster preparedness planning often leads to external entities, such as government agencies or other organizations, taking charge of such planning. This situation is primarily driven by the lack of qualified instructors within the school itself, making it challenging for schools to develop and implement effective disaster preparedness initiatives independently. Instead, they rely on external experts or organizations to

create plans, which can result in these plans becoming mere administrative requirements rather than practical, effective strategies. Furthermore, the reliance on external parties can hinder the adaptability of these plans to the specific needs and circumstances of the school, as there may be a lack of expertise in disaster management within the school community. Therefore, the absence of an in-school organizational structure and the shortage of qualified instructors in disaster preparedness underscore the importance of capacity-building efforts within schools to ensure that disaster planning is not just a bureaucratic formality but a genuinely effective and adaptable process.

3. Selection of Competent Instructors: Competent instructors are the key to the success of a disaster simulation program. They must have knowledge and experience in the field of security and a deep understanding of disaster simulation. Instructor training is also an important part of preparation.

   Based on Module 2 Disaster Management in Schools, the indicator point is that conducting regular evacuation drills/simulations is said to be appropriate if school training is held at least twice a year to practice and improvise disaster mitigation and readiness capabilities and planning. Based on LIPI 2013: Guide to Implementing Disaster Preparedness Schools, the indicator points of holding first aid training accompanied by the relevant agency are said to be appropriate if accompanied by PMI, Community Health Center or the Education Service (Dewi:2020).

   The dearth of proficient instructors for disaster simulation initiatives in schools presents a multifaceted challenge. Many educational institutions lack in-house expertise necessary for the effective design and execution of disaster preparedness simulations, as such skills typically fall outside the purview of regular teaching staff. Consequently, schools often turn to external instructors, often from local emergency services or NGOs, who may be limited in number and juggling other primary job responsibilities, resulting in sporadic availability. This reliance on external experts can also strain school budgets, requiring funding for instructor fees, materials, and equipment. Additionally, it may lead to inconsistencies in the quality and frequency of simulation sessions, as external instructors may vary in expertise and teaching abilities. This confluence of factors underscores the urgent need to address the training and capacity-building of in-house staff and explore collaborative solutions with local agencies to ensure consistent and high-quality disaster simulation education in schools.

4. Measuring Program Effectiveness: It is important to measure the effectiveness of disaster simulation programs. This may include evaluating student knowledge before and after the simulation, time required to evacuate during the simulation, and the student's ability to identify potential risks. This action allows schools to assess the impact of the program and make improvements if necessary. Currently, the

assessment of disaster simulation programs often occurs within the context of research projects, community sercive, or occasional government oversight. However, it would be significantly more beneficial to establish a continuous and self-assessment mechanism that schools can independently implement. This self-assessment instrument would enable schools to regularly evaluate the effectiveness of their disaster preparedness efforts and make ongoing improvements.

5. Parent and Community Involvement: It is important to involve parents and the community in efforts to increase student preparedness. They can provide additional support and help ensure that disaster simulation programs become an integral part of school safety efforts.

   Parents of students have good knowledge about earthquakes, especially regarding earthquake phenomena, but not about earthquake mitigation and emergency response measures. Only 35% of parents will duck, hold on to the table leg and protect their head when an earthquake occurs (duck, cover and hold). Even though they received knowledge about disaster mitigation from researchers and their children, they did not carry out mitigation practices or preparedness exercises at home. When asked whether earthquake disaster preparedness educational material should be taught in schools, all parents agreed and understood the importance of this material being taught in schools to protect their children (Pribadi:2008).

According to the results of School Disaster Resilience Assessment SDRA, schools are expected to make sufficient relationship with parents and the community for enhancing school disaster resilience. Activities for enhancing disaster resilience of each school were proposed through consultation with teachers, the Board of Education, a university, and an NGO. Other schools, family, community, and community-related organizations are included in the many proposed activities (Shiwaku:2016).

In summary, parents generally have limited knowledge of earthquake mitigation and emergency response measures, despite their understanding of earthquake phenomena. Schools play a vital role in closing this knowledge gap by incorporating disaster preparedness education. Additionally, strengthening relationships between schools, parents, and the community is crucial for enhancing overall school disaster resilience and ensuring the safety of students.

Policy Implications

Policy regarding disaster-safe education unit (SPAB) has received a positive response with the issuance of Minister of Education and Culture Regulation Number 33 of 2019. In this regulation, SPAB is interpreted as a preventive and responsive effort to the impact of disasters on all pathways, levels and types of educational units. The scope of SPAB covers three cycles in a disaster, namely pre-disaster, emergency response and post-disaster. In relation to disaster risk reduction, a disaster safe school is an educational community that understands disaster risk, has plans for all disaster cycles, and

preparedness, all three of which are formed through education and disaster literacy. In the regulation in article 7 point *e*, it is stated that educational unit infrastructure that is safe against disasters includes equipment and supplies for simulating disaster management and rescue and evacuation. Also in article 8 point *j,* it is stated that The Education Unit is responsible for carrying out Disaster preparedness simulations independently and continuously at least 1 (one) time in 1 (one) semester.

The implementation of disaster simulation programs in schools carries significant policy implications at both the educational and governmental levels One of the main implications is the need for support from central and regional governments in the form of budgets and resources to implement this program. The government must prioritize school preparedness as part of a national strategy to reduce disaster risk.:

1. Government Funding and Support: Governments should prioritize disaster preparedness education in schools by allocating sufficient budgets and resources for the development and implementation of effective disaster simulation programs. This financial support can enable schools to access the necessary training, materials, and expert instructors.
2. Curriculum Integration: Policymakers should consider incorporating disaster preparedness education into the official school curriculum. This ensures that disaster simulation programs are not seen as optional but rather as an integral part of the educational process. The inclusion of disaster preparedness in the curriculum can lead to standardized and consistent education on this critical subject.
3. Teacher Training: Policies should promote the training of teachers and school staff in disaster preparedness and response. Providing teachers with the necessary skills and knowledge ensures that they can effectively facilitate disaster simulation programs and foster a culture of safety within schools.
4. Community Engagement: Policymakers should encourage schools to engage with parents and the local community in disaster preparedness efforts. This collaboration can enhance the overall resilience of the school and its surrounding area, fostering a sense of shared responsibility.
5. Monitoring and Evaluation: Governments should establish mechanisms for monitoring and evaluating the effectiveness of disaster simulation programs in schools. This includes the development of assessment criteria, regular reporting, and data collection to ensure that programs are achieving their intended goals.
6. Incentives and Recognition: Policymakers can create incentives and recognition programs to encourage schools that actively participate in disaster preparedness initiatives. Recognizing schools for their efforts can motivate them to maintain and improve their disaster simulation programs.
7. Research and Development: Investment in research and development related to disaster preparedness education is crucial. Policymakers should support studies that assess the impact of simulation programs,

identify best practices, and explore innovative approaches to enhance student preparedness.

8. Legislation and Regulations: Governments should enact legislation and regulations that mandate the inclusion of disaster preparedness education in schools. These legal frameworks can ensure that disaster simulation programs are consistently implemented across educational institutions.
9. Public Awareness: Policymakers should promote public awareness campaigns regarding the importance of disaster preparedness in schools. Raising awareness among parents, communities, and stakeholders can garner support and create a collective commitment to student safety.

In summary, effective disaster simulation programs in schools require comprehensive policy measures that encompass funding, curriculum integration, teacher training, community engagement, monitoring, incentives, research support, legal frameworks, and public awareness. These policies collectively contribute to creating a safer and more resilient educational environment for students.

CONCLUSIONS AND RECOMMENDATIONS

Disaster simulation in schools is a very important investment in improving student preparedness in schools. Benefits include increased student understanding, identification of potential risks, reduced fear, and community engagement. Although there are some challenges in implementing this program, investing in disaster simulation is an important step in maintaining student safety and preparedness in schools. In the educational context, disaster simulation is an effort that must continue to be improved to ensure that schools are safe environments and ready to face various disasters. Student preparedness is an investment in a safer and better future. By implementing disaster simulations effectively, we can help students be better prepared to deal with emergency situations, protect themselves, and possibly save lives in dire situations.

FURTHER STUDY

There are the five most urgent issues for further study and action related to disaster simulation and school preparedness:

1. Resource Allocation: Understanding how to effectively allocate limited resources to ensure the accessibility and sustainability of disaster simulation programs in schools, especially in low-resource settings.
2. Long-Term Impact: Investigating the long-term impact of disaster simulation on students' behavioral changes and the resilience of communities after disasters.
3. Community Engagement: Examining strategies to enhance community involvement and support for disaster simulation programs in schools to create a holistic approach to disaster resilience.
4. Policy Frameworks: Evaluating and developing policies and regulations that mandate disaster simulation in school curricula, ensuring that it becomes a standardized practice.

5. Vulnerable Populations: Researching how to tailor disaster simulation programs to meet the specific needs of vulnerable populations, such as children with disabilities, low-income families, and marginalized communities, to ensure inclusivity and equitable preparedness.

These urgent issues can help guide further research and action in improving disaster simulation programs in schools and, by extension, enhancing disaster preparedness and resilience in communities worldwide.

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