

## Student-Based Disaster Management: Alternative Solutions to Build a Disaster-Resilient City

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**Abstract:** *Disasters that have occurred in the past should serve as a valuable lesson for those who will come after them. This is the most important factor in determining how prepared a community is. According to common knowledge, the city of Palu is one of the cities that is particularly vulnerable to natural disasters due to its geographical location, which is situated between the confluence of two tectonic plates of the Pacific Ocean and Asia, necessitating the need for residents who live in the area to be prepared for such events. As a result, the purpose of this study is to determine the value of studying disaster preparedness from a young age in order to reduce the impact of disasters generated through the use of a spatial education strategy. The descriptive method is used with a qualitative approach in this investigation. The findings indicate that preparedness education should begin at a young age in order to instill a sense of vigilance in kids, rather than a sense of terror. Geography education, as well as disaster preparedness learning materials that are based on geography, is very important for building a strong foundation in disaster preparedness learning from both a physical and geographical point of view.*

**Keywords:** *Learning, Preparedness, Geography Education, Students, Disaster.*

### Introduction

Disasters that occur in Indonesia are mostly related to geological processes such as earthquakes and volcanic activity, as well as hydrometeorological processes (hydrometeorological) such as droughts, fires, landslides, abrasion, erosion, hurricanes, floods, and so on (Adiyoso, 2018). As a result of its geographic location at the meeting point of the Eurasian Plate, the Indo-Australian Plate, and the Pacific Ocean, Indonesia is prone to earthquakes and volcanic eruptions. Indonesia is prone to earthquakes and

volcanic eruptions because of the three plates colliding. As a result, the Ring of Fire encompasses Indonesia as a whole (Benardi, 2017). The territory of Indonesia, which is 70% of the ocean, causes Indonesia to be prone to tsunamis generated by tectonic and volcanic activities (Mujiburrahman et al., 2020).

The disaster happened unexpectedly. Disasters caused by both natural and human causes cause high mortality rates and damage to property and infrastructure. Disaster events in Indonesia are a phenomenon and make

school children learn about disasters so that they are better prepared if a disaster occurs around their home or in a remote location (Rahma, 2018). To minimize risk or loss for humans, knowledge, understanding, and preparedness skills are needed to prevent, detect, and anticipate early on various kinds of disasters, especially in places prone to natural disasters (Amirudin et al., 2020). Disaster preparedness is a basic need for every individual to reduce the risk of disasters regardless of time and place. A prevention scheme with the proper method is needed so that the risk of disasters that occur can be minimized, especially with regard to human victims. Natural disasters can be prevented in different ways depending on the territory's geographical position, the regular catastrophes that take place in the area, and the socioeconomic characteristics of the community. Therefore, each region needs to do its own research to determine the best approach (Ardiansyah, 2017).

Preparedness is an effort to prepare for the impact of a disaster whose aim is to build the readiness of government officials and all stakeholders in dealing with disasters and build the resilience of individuals, communities, and social and economic activities (Kurniawati & Suwito, 2017). In the meantime, disaster mitigation is an effort to minimize the impact of future calamities (Maryani, 2012). There are a lot of things that go into disaster management, like making policies that could lead to disasters, disaster prevention and response activities, and rebuilding and rehabilitating areas that have been affected by disasters (Jati, 2013), among other things.

Schools, as places of learning for children, should make every effort to safeguard and protect all students from a variety of disruptions in their schools, including the possibility of disasters that might strike at any time while at school, including natural disasters. The lack of Standard Operating Procedures (SOPs) and disaster management techniques in schools will lead to less effective disaster management, which will lead to more people being killed (Tyas et al., 2020).

Schools should also prepare their citizens to be ready to face disasters that can occur at any time. Disaster preparedness schools can manage disaster risk in their environment (Rahma, 2018). The concept of disaster preparedness school is intended to build school and community preparedness in anticipating disasters (Heri & Caesar, 2018). Schools, then, need to come up with a disaster management plan that fits the type of disaster that happens at their school.

The concept of disaster education begins by providing special knowledge related to disasters in their environment; the community is provided with experience and understanding related to disasters that often occur in their surroundings. Disaster Risk Reduction Education is a long-term activity and is part of sustainable development. Disaster Risk Reduction and Prevention Education is designed to build a safe culture and a resilient society (Tahmidaten & Krismanto, 2019). Disaster education includes preparedness education, disaster mitigation education, disaster emergency response education, disaster recovery education, and post-disaster activities. Disaster education seeks to improve protective measures by providing

information about the hazards and risks. There will be more people who know how to be safe in all kinds of disaster-related activities if it is planned and done well (Setyowati, 2019).

According to Purwantoro (2011), disaster education aims to: 1. Provide information to students about correct knowledge about disasters. 2. Provide an understanding of protection in a systematic manner. 3. Providing students with practical training on how to protect themselves and respond to disasters in a timely and accurate manner. The importance of understanding disaster for the present and the future shows that humans, to save themselves from the threat of disaster, must be carried out sustainably, with a guarantee of intergenerational relay that can be accounted for. Thus, the initial foundation of disaster education from an early age is a provision for a society aware of disasters from time to time. By referring to environmental education, disaster education includes lifelong education (Soetaryono, 1999).

On the basis of its topography, Palu is located between 0 and 16 m above sea level, with 70% of the city's terrain being flat and the remaining 30% consisting of hills and prone areas. The mountains separate the west from the east, which is an area of lowland that borders the Makassar Straits. The current condition of the city of Palu has the potential to increase the risk of various disasters triggered by natural and human-made events. The location of Palu City is at the confluence of the Pacific Ocean tectonic plate and the Asian tectonic plate, which has caused Palu City in recent years to be frequently hit by tectonic earthquakes.

Based on historical records, earthquake disasters also occurred in 1833, 1914, 1940, and 1980. In 2018, there was another relatively large earthquake in Palu City, namely a 7.4 on the Richter scale. The number of earthquakes that occurred during 2018 was recorded to have caused a tsunami which caused many casualties (BPBD Palu City).

Besides earthquakes, Palu City is also frequently hit by natural disasters such as floods. In 2019, the flood disaster in Palu City occurred 6 times, with 12,240 refugees, 4,144 affected residents, and 4,630 houses submerged; the average cause of flooding in Palu City is heavy rain (BPBD Palu City). Static natural conditions such as geography, terrain, and the geometry of river channels can generate floods. High rainfall damming from the sea and tidal rivers are examples of dynamic natural processes. Static natural conditions, such as geology, terrain, and the geometry of river channels, can create floods. One example of a natural phenomenon that changes over time is when sea or tidal rivers are dammed up because of a lot of rain.

Based on the above background, the authors are interested in researching disaster preparedness learning for students in Palu City as an effort to be able to mitigate the impact of disasters from an early age and as an effort to determine the level of understanding of students about disaster proneness. In this study, the author will show how geography education can help students learn about disaster preparedness in a different way.

## **Method**

The qualitative technique was used in this investigation. The information

gathered is secondary information, which refers to writing data that has been gained indirectly or through intermediary media. Secondary data is present in evidence, notes, and reports, whether or not they have been published (documentary data). The descriptive qualitative method of data analysis was employed in this study; that is, the information gathered and then collated to aid in the discussion of the topic was used (Sugiyono, 2011). The data analysis process used in this study included the following steps: (1) data collection; (2) data reduction; (3) data presentation (data display); and (4) conclusion presentation and verification (conclusion drawing and verification).

### **Result And Discussion**

Learning is something that students do, not something that students make (Jailani & Hamid, 2016). In doing something, educators always assist and direct students so that what they do becomes directed and follows the goals to be achieved. Oktiani (2017) said that learning is an educator's effort to help students carry out learning activities. The learning activity itself is the achievement of a set of values, attitudes, perceptions, behaviours and several meaningful knowledge for students' lives. Educators always direct learning objectives to be achieved effectively and efficiently. The parties involved in learning include the curriculum, teachers, students, learning media, and the learning situation itself. Everything interacts and is independent to determine the quality of achieving these goals (Fakhrurrazi, 2018).

Psychologist Piaget asserts that learning exchanges occur continually and are carried out by humans with their

environment, despite the fact that the environment itself changes on a regular basis. As a result of this ongoing change in the environment, the learning function is constantly evolving (Hanafy, 2014). Learning is a mix of factors that are methodically arranged between people, materials, facilities, technology, and procedures in order to attain goals and achieve them more effectively. Teachers, principals, students, and administrators are among the people who work at schools, as are the resources, which include books, blackboards, photographs, and audiovisual presentations. Routines and ways of imparting knowledge, such as learning models, practice sessions, exams, and so on, fall under the category of procedures (Sari & Putra, 2016).

According to Nurjannah et al. (2020), the learning model must meet the following principles: (1) learning must be improved if the efforts made by the teacher are smaller and the learning activities of students are getting bigger; (2) the less time required by the teacher in activating students to learn, the better the learning will be; (3) following the way of learning carried out by students; (4) can be implemented well by the teacher; and (5) there is no single perfect method that best suits the objectives, types of materials, and existing learning processes.

1. Individualistic learning: students believe that completing learning objectives on their own will result in success, they do not interact with other students, and they do not rely on their own good or bad performance. 2. Competitive learning occurs when one student achieves a good result while the other students do not (a win-loss situation). Thus, every effort an individual makes to

achieve goals is a rival to other individuals.

3. Cooperative learning occurs when students can achieve their objectives with the assistance of other students who collaborate to achieve these objectives. Each individual takes part in contributing to the achievement of these goals.

The geography learning curriculum (2013) has three assessment references: cognitive, affective, and psychomotor. This study focuses more on the affective attitude of students toward disaster mitigation. According to Allport, attitudes are a mental and neural state of readiness organized through experience, exerting a directive and dynamic influence upon the individual's response to all objects and situations to which they are related. Attitude indicators follow Bloom (in Munthe, 2013), namely, receiving, participation (responding), assessment/determination of attitudes (valuing), organization, and character building (characteristics). According to Sudjana (2005), attitude is a person's readiness and willingness to accept or reject an object based on an assessment of the object; attitude can also be seen as a person's tendency to behave (predisposition). Attitude learning outcomes appear in the form of willingness, interest, attention, change, and feelings. Attitudes are mental and neural states acquired from experience, which directly and dynamically influence individual responses to related objects and situations.

The era of globalization demands all elements of society, especially in education, which indirectly deals with students. The education delivered requires knowledge, understanding, and

constantly evolving skills. School is a reasonable means to be used as a learning process. The teaching and learning process is successful if the related components support each other. According to Parnawi (2019), learning is a permanent change in behavior due to experience. One sign that someone has learned is a change in their behaviour.

These behavioural changes involve both changes in knowledge (cognitive) and skills (psychomotor), as well as those concerning values and attitudes (affective). Thus, the learning process in the classroom will take place comfortably and will encourage students to be more enthusiastic about learning. When it comes to learning geography, all of that cannot be separated from the environment and the phenomena on earth. Subjects at school that discuss natural phenomena are geography. Students with all the potential that exists in themselves to constantly be developed both through the learning process and when interacting with everything. The teacher is the primary learning component in creating a good atmosphere in the classroom.

According to Daldjoeni (2014), five demands need to be met by geography teachers, including a) teachers must have enough attention to human problems to give learning to students at school; b) the teacher can discover for himself the locational factors, regional patterns, and spatial relations that are contained or hidden behind social phenomena; c) the teacher can distinguish and separate real quality from things that are merely necessities. When the teaching and learning process takes place in schools, the role of the teacher becomes the most important thing; experienced teachers will

provide students with detailed knowledge of what to do and what not to do in each lesson that takes place both in the classroom and on the field.

Geography is a compulsory subject at the secondary school level. This geography lesson discusses all human activities, natural phenomena, and other living environments on earth, following the title of the researcher regarding natural phenomena in Palu City. It should be done by applying the field trip method in the geography learning process so that the mental basis of students, which includes a sense of curiosity, sense of interest, and attitude, can be fostered and developed. The focus of this learning method is that students see and feel natural phenomena for themselves directly.

Disaster mitigation is included in the 2013 curriculum as one of the learning tools. As defined by Law No. 24 of 2007, disaster mitigation is an effort to reduce the impact of disaster risk, either through physical development, public awareness, or capacity building in dealing with disasters. Disasters, on the other hand, are occurrences or series of occurrences that threaten or disrupt people's lives and livelihoods as a result of natural or non-natural factors. Along with human elements, that results in human casualties, environmental damage, property losses, and psychological consequences.

To foster a sense of awareness and enthusiasm for students, it is necessary to have attitudes and actions ready to seek disaster mitigation in Palu City. If students have mastered the knowledge and understanding of a problem, then the formation of student attitudes will occur. Disaster mitigation is not a local concern

in schools but becomes a subject of discussion in geography subjects at school. This disaster mitigation aims to know and understand disasters and be good at acting when passing through earthquakes and landslides. Researchers focus more on earthquakes and floods because the research area is a red zone for earthquakes and floods.

In Junior High School (SMP), in the Geography subject on the natural environment, students learn about geomorphological features in their area and their involvement in disaster reduction. On territoriality, students learn about the uniqueness of the natural environment that significantly influences the local industry. Participation in disaster prevention differs according to the characteristics of each region, for example, in the Jakarta area, where floods often occur. Students learn to understand and research the history of flooding in Jakarta, explain the potential for flooding, and analyze weather, climate, and topography to find out the relationship behind the pattern of flooding. Introduction to the Meteorology, Climatology, and Geophysics Agency (BMKG) and observation of spatial graphs to better understand weather and flood patterns are among the activities covered. Student map-making skills are developed through the use of maps, aerial photographs, and other imagery, which includes rainfall data, contour lines, and probable flood areas. Additionally, students are encouraged to examine human efforts in the face of floods and to combine this information into a "disaster preparedness" plan. The disaster teachings are included in the lesson plan for each school, which has various regional

features and a different possibility of disaster.

The Geography subject in SMA contains material on the environment and disaster prevention. Students study the characteristics of the natural environment in Indonesia and its natural disasters. Students also understand that involvement in area-based disaster management is significant. Students learn about data-based disaster hazard evaluation. Through these activities, they gain the ability to view disasters objectively. For disaster education, the ability to read maps is an important skill. Students learn to read and use potential disaster maps and topographic maps related to everyday life.

Nearly all of Palu City's residential and commercial areas are at risk from earthquakes. People and infrastructure are put at risk by earthquakes. Students are encouraged to learn about disasters through disaster education. "Why do earthquakes happen?" Preparation is the key. As a matter of fact, researchers in Indonesia can use web-based spatial data from the BMKG website to find out where earthquakes are most likely to strike. There are three lessons on earthquakes in the lesson plans:

1. Earthquake hazard spatial distribution in Indonesia and around the world;
2. The process of movement of the earth's plates that causes earthquakes, and
3. Preparation for earthquake hazards.

Students are introduced to new topics through hands-on activities and web-based spatial data in every course. Because of the way classes are set up,

students are expected to work together. Seismology is taught through the use of maps and the building of fault models, which students are expected to comprehend and utilize to gather information about earthquake threats. For students who want to better understand how seismic activities affect Indonesia and the rest of the world, it is helpful to learn the fundamentals of seismology. Students can determine whether or not they require earthquake safety planning based on the information gathered.

Nearly half of the world's population lives within 125 miles of the coastline, which is home to over three billion people. About 150 million Indonesians reside along the country's coastline, increasing the country's vulnerability to tsunamis and the effects of climate cycles like La Nina and El Nino. This phenomenon can be used as a learning tool in the national curriculum. Indonesia, including the city of Palu, which is on the Ring of Fire route and is located between two continents and two large oceans, has a high potential for disaster.

From various existing studies, it turns out that students' preparedness has shown that they are ready, but some are still showing that they are not prepared. As Sunarto & Marfai (2012) said, several factors could make children very vulnerable. This is also related to whether the readiness parameter in schools is sufficient regarding disaster mitigation efforts so that students are better prepared to face a sudden disaster.

The research results show that the implementation of disaster mitigation programs in schools is feasible. Each research result shows that programs can improve student preparedness. By doing

several simulations in several schools, providing material or knowledge about mitigation inserted into learning, the application of role-playing, and the readiness of schools regarding regulatory policies to implement mitigation, will build students' understanding of how or what actions to take so as not to panic. The implementation of comfort that has been carried out can be a recommended activity to increase students' knowledge of disaster mitigation at school. With knowledge and application through simulation, for example, 5-6 times, is enough to provide a significant change. The application of mitigation can also help students understand knowledge about natural disasters, attitudes towards natural disasters, the importance of the environment being protected to prevent disasters, and find alternative ways to contribute to mitigation efforts.

In this study, the assessor proposed that in starting disaster preparedness education in schools in Palu City, each school should ideally carry out a series of activity processes:

1. Participate in training or debriefing on disaster management and disaster risk reduction.
2. Recognize disaster risks around school locations.
3. Planning the integration of the curriculum into the annual, monthly, weekly, and daily learning plans and monitoring learning outcomes by integrating Disaster Risk Reduction materials into learning materials; incorporating Disaster Risk Reduction materials into core subjects and local content; incorporating Disaster Risk Reduction materials into self-development programs

4. Conducting Disaster Risk Reduction: Education subjects Integrating disaster preparedness education into school policies.

Education concerned with disaster risk reduction is carried out by providing evidence that schooling contributes to the necessary knowledge and skills for disaster preparedness.

## **Conclusion**

The prevention of disasters, which occur frequently in Palu, is essential in order to decrease the impact of the disasters and reduce the damage they produce. As a result, it is extremely necessary to teach pupils about catastrophe readiness and response. Schools are formal educational institutions that have been shown to be effective in altering people's attitudes and behaviors. Education can assist in molding students' knowledge, skills, and attitudes so that they can subsequently act as change agents in their communities, resulting in the development of a disaster-aware community culture. In practically all disciplines, disaster education can be incorporated into the curriculum. These subjects include geography; history; economics; citizenship; social studies; language; arts; mathematics; science; physical education; health and technology. Physical and spatial views are taken into consideration when learning about catastrophe preparedness. The provision of disaster mitigation materials to students has demonstrated that it results in outstanding comprehension, with participants becoming aware of what to do in the event of a disaster.



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