

Earthquake disaster literacy learning model in geography and social sciences subjects in junior high school

Dina Siti Logayah¹, Mamat Ruhimat¹, Enok Maryani¹, Riko Arrasyid¹

¹Faculty of Social Sciences Education, Universitas Pendidikan Indonesia, Bandung, Indonesia

Abstract. The aim of this research is because Indonesia is geographically and geologically the most disaster-prone country in the world. Based on this phenomenon, education can anticipate the high number of disaster victims. Learning at school is one of the bridges to student preparedness through the disaster literacy model. The research method used is Research and Design (R&D). Data collection uses documentation, questionnaires, tests and interviews. The results of the research show that most students have sufficient knowledge regarding disaster literacy, curiosity about disaster material is very high, attitudes during a disaster show high awareness, and awareness of disaster literacy is good. The weakness is that students only understand disasters from the media and their skills in dealing with disasters are still low. The implication of this research is that disaster literacy provides an opportunity in schools to form a character that cares about disasters.

1 Introduction

Geographically and geologically, Indonesia is an archipelago nation in Southeast Asia. With a population of around 268 million and more than 17,508 islands, Indonesia is one of the world's largest archipelagic nations, with a coastline that stretches up to 81,000 kilometers. Indonesia is extremely sensitive to catastrophes due to its geographic and geological location; in fact, it is ranked the first one out of 256 countries with a higher probability of a tsunami disaster than Japan. According to the United Nations International Strategy for Disaster Reduction (UNDRS), this is in line with the claim. Indonesia is said to be the country most susceptible to natural disasters globally [1-3] six determinants Indonesia is the most disaster-prone nation globally due to: 1) its intersection of three major tectonic plate boundaries, which poses a risk of earthquakes; 2) its status as an active volcanic region, featuring 129 volcanoes, 80 of which are deemed hazardous, thereby situating Indonesia within the "Ring of Fire," a network of active volcanoes encircling the Pacific Ocean, which increases the likelihood of volcanic eruptions and landslides in steep terrains. 3) Indonesia possesses the second longest coastline globally and is susceptible to tsunamis, 4) the country experiences a tropical climate that induces land fires, floods, forest, and droughts, as well as coastal erosion, 5) a significant portion of the Indonesian populace resides near rivers, lakes, and the sea, as well as at the base of mountainous regions, which heightens the risk of landslides, 6) the disaster preparedness among the Indonesian populace is markedly inadequate. Indonesia,

intricately linked to its geographical and geological context as well as its social and cultural conditions, has been recognized as one of the most generous nations in the first world for five consecutive years, according to the 2022 World Giving Index, and is characterized by its rich multi-ethnicity and diverse cultural heritage [4]. Despite being classified pedagogically, a significant portion of the Indonesian populace is characterized by low educational attainment and economic status [5].

Given the precarious topographical and geological circumstances in Indonesia, the government has proactively tackled disaster-related issues through the enactment of Law No. 24 of 2007 on disaster management, which governs comprehensive disaster management practices encompassing pre-disaster, emergency response, and post-disaster phases, along with community preparedness initiatives. Additionally, the government enacted Regulation Number 21 of 2008 pertaining to disaster management, as outlined in Articles 3 and 6. Minister of Home Affairs Regulation No. 14/U/KEP/I/1967 established a national coordinating team for natural disaster management. The 2005 earthquake and tsunami disaster in Aceh compelled the Indonesian government to prioritize disaster management, resulting in the issuance of Presidential Regulation No. 38 of 2005, which pertains to the National Disaster Management Agency (BNPB) and delineates its coordinating role within disaster management [6]. In accordance with the Indonesian government's stringent disaster legislation, the education sector is mandated to equip students with disaster literacy, as stipulated in BNPB Head Regulation (Perka) No. 4 of 2012 concerning disaster-safe schools, particularly in areas susceptible to disasters. Disaster literacy is crucial not just in Indonesia, as evidenced by several research findings [7, 8] residents in Fukui, Japan, possessing disaster education, are better prepared than those in San Francisco lacking such knowledge. Muttarak and Pothisiri (2013) asserted that education enhances cognitive abilities and skills in risk assessment, whereas formal education can augment disaster preparedness and diminish susceptibility to natural catastrophes. [7]. Other research results revealed by Mark Anthony, et al [9] from several countries related to disaster literacy such as the Philippines provide an illustration that the country has a disaster literacy pilot project inspired by the Typhoon Morakat incident which already has a learning strategy. Enhancing literacy regarding the Typhoon Morakat disaster in educational institutions through the implementation of disaster preparedness initiatives in project schools aims to promote pilot programs in educational technology for natural disaster prevention from 2003 to 2007-2011 for students in grades 1-12 and the broader community via e-learning. In the Philippines, disaster education is incorporated into the high school curriculum, particularly within geography and other subjects, to foster a culture of safety and resilience against disaster risks. The findings of a separate research conducted by Sung-Chin Chung and Cherng-Jyh Yen (2016) delineate a conceptual framework for disaster literacy with three components: knowledge of disaster reduction, attitudes towards disaster reduction, and abilities for disaster avoidance [10]. Other studies indicate the critical necessity for societal and institutional knowledge on the significance of preventive prior to a disaster through non-structural mitigation measures. The findings of the research [11] it is recommended that disaster communication materials be developed and evaluated for vulnerable populations in order to enhance disaster literacy. Additionally, routine trials and evaluations should be considered to inform the selection of media types.

The incorporation of technology in education, particularly through multimedia, addresses issues related to verbalism by integrating videos and animated visuals into the learning experience. [7]. Lee's research (2010) indicated that the conflict between literacy requirements and the resources available for disaster preparedness and recovery education contributes to a deficiency in comprehending effective information related to disaster rescue or preparedness. [12]. A study on disaster literacy in Costa Rica conducted by Vaughan,

Gack, Solorazano, and Koike et al. (2018) indicated that with proper guidance, students can positively influence their parents and other adults within their social environment [13]. Providing the transfer of knowledge from the teacher to students by integrating it into subjects at school through the levels of each class [14]. Shaw et al. (2011) indicated that Pakistan urgently needs to address the deficiency in flood disaster preparation inside schools [15]. Pakistan is always hit by floods every year. Likewise with Malaysia which is always affected by flood disasters. Shaw et al., (2011) revealed that the importance of disaster literacy is applied to disaster-prone learning and schools [15]. Disaster education in Indonesia can be carried out starting from kindergarten to tertiary level by inserting subjects in geography, social studies, languages, religion, and other learning. One of the subjects that provide space and time in inserting disaster literacy material, namely geography and social studies, discusses a lot and links disaster mitigation material. This content and material relate to the natural conditions of a country. Regarding studying these natural conditions, each student is required to understand disaster literacy in each environment where students live against disasters that can threaten their lives.

2 Literature Review

Literacy encompasses the capacity to critically interpret information, thereby facilitating access to science and technology as a means to enhance quality of life [16]. The Indonesian government's policy on literacy is governed by the Ministry of Primary and Secondary Education, which acknowledges the School Literacy Movement (GSL). This initiative encompasses proficiency in six areas: 1) reading and writing literacy; 2) numeracy literacy; 3) scientific literacy; 4) digital literacy; 5) financial literacy; and 6) cultural and citizenship literacy. Multiple School Literacy Movements (GSL) aim to develop literate citizens and promote the advancement of the school literacy movement. The implementation of GLS comprises three key components: 1) habituation activities aimed at cultivating a culture of literacy and enhancing students' interest in reading within the school environment; 2) development activities that concentrate on improving literacy skills by reinforcing habituation through non-academic initiatives; 3) learning activities that seek to enhance literacy skills across all subjects by employing literacy strategies in instruction, supplemented by enrichment books.

Disaster literacy is essential for fostering character, cultivating a compassionate disposition, and promoting environmental and societal responsibility. Fostering disaster literacy may be achieved via education to provide students with sufficient intellectual, emotional, spiritual, and social competencies. The talents acquired encompass survival skills and proficiency in navigating change, conflict, uncertainty, and complexity of life. The essential abilities for the 21st century are characterized by the fast advancement of information and communication technologies. The advancement of information technology induces transformations in many facets of existence. Every nation, including Indonesia, must adapt to contemporary needs. Binkley et al. (2014) assert that to thrive in the 21st century, students must possess ten essential skills: critical thinking, creative thinking, metacognitive thinking, collaboration, communication, information literacy, citizenship, ICT literacy (Information and Communication Technology), individual and social responsibility skills and work and career competencies. Nugraha and Octavianah (2020) introduced the notion of a spectrum of talents and knowledge essential for the 21st century [17-18]. This perspective aligns with the objectives of the Partnership for 21st Century Skills (P21), which categorizes essential 21st-century skills for students into learning and innovation skills, life and job skills, and media and information technology skills [19]. The National Literacy Act defines literacy as the capacity to read, write, communicate, and analyze information to solve everyday

challenges. Digital literacy was initially introduced by Paul Gilster in 1997 as the capacity to comprehend information in diverse formats when using a computer. In the 21st century, fundamental literacy necessitates that every human have disaster literacy, defined as the capacity to read, write, and acquire additional information and skills pertinent to certain domains [20].

The context of disaster literacy in learning is very supportive in the contextual life of everyone. This is explained in the research results of Sözcü & Türker (2021) which states that the level of literacy in society needs to be increased and evaluated regarding the dangers of disasters that occur in the universe where humans live [21]. So that the context of disaster literacy is very important to be used as lifelong learning. Disaster literacy consists of dimensions of knowledge, attitudes, and skills. First, we can encounter the dimension of knowledge regarding disaster literacy in everyday life, but we often ignore this by every individual with frequent disasters. The second dimension of attitude is the internalization of knowledge which is the basis for disaster literacy. The three dimensions of skills are the transformation of knowledge that is internalized and adopted into behavior. This disaster literacy is closely related to disaster mitigation which can be defined as the steps taken beforehand and reducing the impact of a disaster. Disaster literacy can refer to preventive actions before a disaster or eliminating or reducing the impact and risk of a hazard. Education and learning activities will be beneficial in promoting disaster preparedness, catastrophe reduction, and the development of communities with a high level of disaster literacy [22].

The disaster literacy conceptual framework and disaster literacy dimensions, as defined by Sung-Chin Chung and Cherng-Jyh Yen (2016), are comprised of the following: 1) aspects of disaster reduction knowledge: disaster knowledge, preparedness knowledge, and response knowledge; 2) aspects of disaster reduction attitudes: sensitivity to disaster prevention, values related to disaster prevention, and a sense of responsibility for disaster prevention; and 3) aspects of disaster prevention skills: preparedness actions and behavioral responses [10]. Research findings concerning disaster education and disaster literacy among students, as reported by Kimura et al. (2017), Shaw et al. (2011), Shaw et al. (2015), and Sung-Chin Chung & Cherng-Jyh Yen (2016), indicate that acquiring disaster education and literacy enhances survival skills. This enhancement signifies that disaster literacy equips students with the knowledge and preparedness necessary to effectively respond to disaster scenarios, including appropriate actions and necessary tools. 2) increasing competency and skills, meaning that disaster literacy allows students to comprehend and develop the competencies and abilities needed in coping with catastrophe scenarios, such as understanding natural occurrences and knowing what actions to take; 3) Enhance disaster literacy among students to comprehend the significance of solidarity and collaboration in crisis scenarios, hence fostering compassion and knowledge of human rights. 4) Enhancing knowledge and awareness, indicating that disaster literacy equips students with an understanding of catastrophes and their consequences, while also imparting the knowledge necessary for students to protect themselves and assist others during disaster scenarios; 5) Enhance active engagement; disaster literacy enables students to engage proactively in disaster preparedness and response, assisting the government and relevant entities in managing catastrophe scenarios [10, 15, 23, 24].

3 Methods

The R&D approach used in this study is a situation which can be explained as follows. The main goal is not to test theory, but to develop and validate tools used in schools to work effectively and ready to use. Borg & Gall (2007) says "educational research and development (R&D) is a process used to develop and validate educational production". The research and

development process consists of continuous cycles, where each stage is informed by the outcomes of preceding phases, ultimately culminating in the creation of a new educational product, these products are developed to meet the needs and based on the specifications set determined. R&D produces products that have been evaluated in the field and have been revised to a certain level of effectiveness. This research approach is confined to a preliminary study (idea) comprising three initial phases: (1) collecting of initial data and information, (2) planning, and (3) building of the original product. The research target was junior high school level students in West Java with a total of 364. The subject of this study was a review of disaster literacy literature to improve disaster resilience character [25].

4 Results and Discussion

Indonesia by the United Nations International Strategy for Disaster Reduction is categorized as the country most prone to natural disasters in the world. Indonesia's geological location and position make Indonesia very fertile against natural disasters. Disaster literacy is one of the efforts to provide knowledge, attitudes and skills to students and the public about the importance of human presence on earth in overcoming disasters. Growing disaster literacy in students and the community is not easy, it requires awareness efforts in the community for disaster preparedness. Educational institutions are one place that can be maximized to achieve this goal. Through educational institutions, especially in primary and secondary schools, disaster literacy is urgently needed. Therefore, the learning process carried out by the teacher must lead to efforts to raise students' awareness of effective disaster mitigation to prepare for disaster preparedness from an early age. The study at this stage was also carried out on students in junior high schools. Implementation data regarding disaster literacy was obtained through collecting perceptual opinions about students' knowledge, attitudes, and skills by using a questionnaire or optional closed-questionnaire Yes and No.

Three primary components comprise the concept of disaster literacy: knowledge, attitudes, and abilities related to catastrophe prevention. The description of these three disaster categories includes disaster prevention knowledge, which comprises three indicator indices: disaster identification, disaster knowledge, and response knowledge. The evaluation of disaster prevention attitudes was conducted through the analysis of disaster prevention sensitivity items, values associated with disaster management, and the sense of responsibility for disaster prevention. Skills for disaster prevention encompass knowledge related to disaster management and mitigation, essential competencies for understanding these processes, and fundamental attitudes necessary for effectively coping with disasters [13], [23], [26], [27], [28]. The initial questions that were confirmed to the students were regarding the students' knowledge through the teacher's statements giving material about disasters, the opportunity to ask questions about disasters, examples of disasters in the environment, the use of media in disaster material, the social studies teacher's interest in delivering disaster material, making disaster material, and assignment of disaster materials. Based on the results of the questionnaire, various respondents' answers were obtained as shown in the following Fig.1.

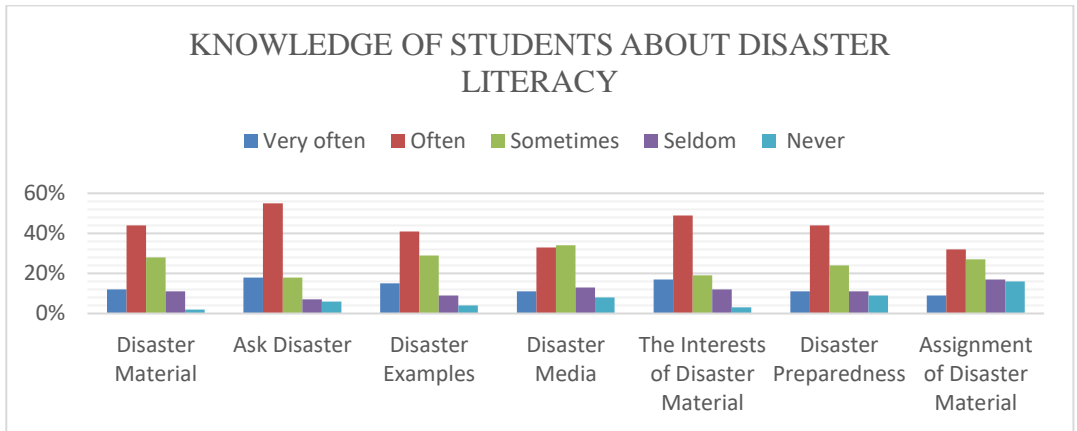


Fig. 1. Knowledge of Disaster Literacy

Based on the data in graph 1. disaster literacy knowledge indicators with seven questionnaire statements obtained information that most students have a moderate level of disaster knowledge on average at 55%. This means that most students should have high disaster literacy considering that Indonesia is a country prone to natural disasters. Referring to such conditions, what is interesting is that students are very high in asking questions about natural disasters in Indonesia, this should be a capital for learning in schools that can be utilized in learning materials and in fact material about disasters is only inserted or integrated into social studies learning materials, geography, language, and other learning. Furthermore, on the indicators of disaster literacy attitudes, information is obtained as listed in the Fig.2 as follows.

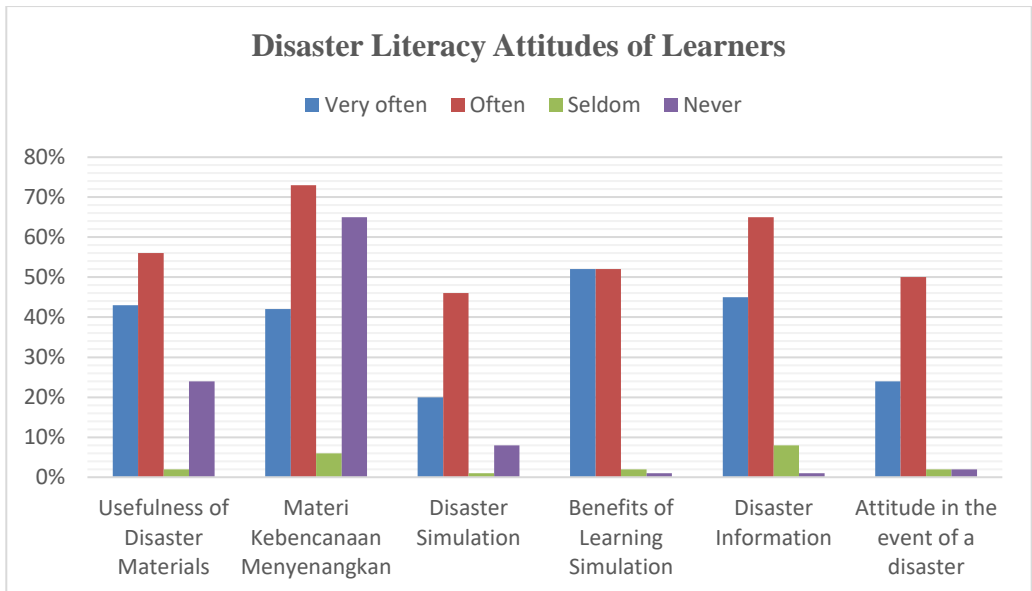


Fig. 2. Disaster Literacy Attitudes

Disaster literacy attitude indicator on a chart. 2 with six statements namely: the benefits of disaster material, fun/interesting disaster material, activities to carry out disaster

simulations, the benefits of obtaining disaster simulation learning, information about disasters, and attitudes that must be carried out in the event of a disaster have a high level of disaster literacy with an average -average 75%. This means that most of the attitudes that students have towards disaster literacy have an awareness of the dangers of disasters that occur in their surroundings. Referring to these conditions, the learning process must be utilized to understand disasters. Furthermore, the skills indicators obtained information as listed in the Fig.3 as follows.

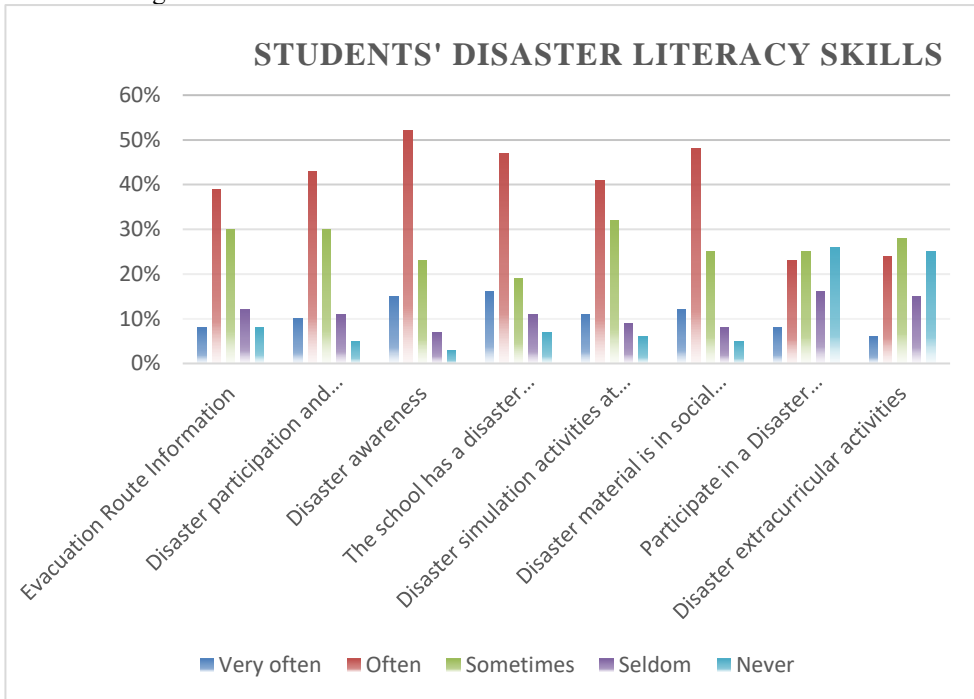


Fig. 3. Disaster Literacy Skills

Based on the data in graph 3. indicators of disaster literacy skills, some students in awareness of knowing disaster mitigation are very high, this also proves that students know that their country is prone to natural disasters by 55%. On the other hand, the disaster literacy skills indicator reveals that if disaster material is found in the subject matter, this material is very interesting. But unfortunately, the disaster material in the subject is still in the range of knowledge. It can be seen in graph 3 that simulation and extracurricular activities are still very low and minimal. Thus, through the learning process it is hoped that disaster literacy skill activities can involve students in learning or extracurricular activities.

In the aspect of students based on the SWOT results, the strength of most students has sufficient knowledge related to disaster literacy, curiosity about disaster material is very high in students, the attitude of students when a disaster occurs is shown with high awareness because students know the surrounding environment is prone to disasters and awareness of disaster literacy in students has been well developed, this can be seen in student learning activities. Weaknesses in the aspect of students mostly only understanding disasters obtained from the media and students' skills in dealing with disasters are still quite low. Chances are that most students get information from social media, television, or news so that students have initial knowledge about disasters not only through information from teachers and there are some students who have experienced natural disasters so that their sense of sensitivity to disasters is very high by means of what should students do. As for threats to students, most

students have a response that is not optimal in disaster literacy because it is only limited to knowledge so that skills in disaster preparedness are still low and students are still ignoring when a disaster occurs. This is because students are still much less skilled in dealing with disasters.

Enhancing disaster literacy to shape student character can be achieved through the implementation of a disaster literacy model that utilizes a learning framework focused on experiential involvement, crafted by educators to facilitate authentic learning experiences. This strategy encourages students to acquire more experience by active and personal engagement, as opposed to only reading content or concepts. Consequently, experiential learning centered on disaster literacy emphasizes students' open learning experiences, allowing for self-directed guidance. The following Fig.4 is a conceptual scheme for the design of a disaster literacy model in learning.

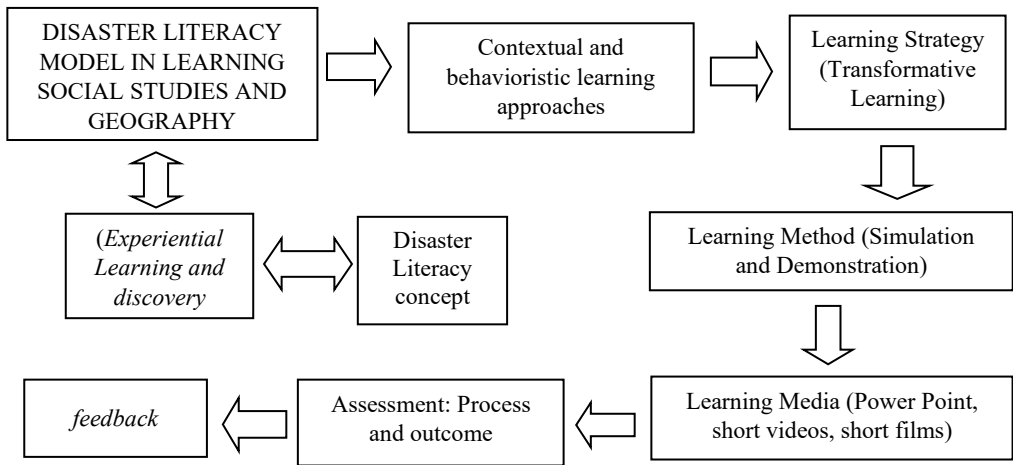


Fig. 4. Conceptual Scheme of Disaster Literacy Model Design in Social Studies Learning

Figure 4 can provide the experience of teachers and students in developing disaster literacy models in school learning so that they form students who have disaster resilient characters.

5 Conclusion

Indonesia is a country that has unique and distinctive features in the world. Located at a confluence of tectonic plates in the world, Indonesia has the potential to cause devastating disasters such as earthquakes, volcanic eruptions, tsunamis, landslides, floods, fires, and tropical winds. One of Indonesia's concerns with the numerous catastrophes that occur there is that people don't know enough about how to leave on their own in an emergency. Even though knowledge about disasters is important when trying to save oneself. What's more, many victims are children due to the lack of outreach about disasters both in society in general and in schools. School is the most effective place to disseminate information to students. One of them is information about disasters, for this reason students need to be provided with information about disasters so that disaster resilient characters are created that will be useful when facing disasters. Schools need to prepare special programs either through outreach on how to evacuate independently or through integrated disaster education in lessons. Disaster literacy is a disaster mitigation initiative aimed at equipping pupils with knowledge about disasters and fostering awareness of probable occurrences. Literacy is not only about

improving the ability to read, write, speak, and listen, but in this case literacy activities are used to gain knowledge about various types of disasters, how to evacuate independently and how to deal with them. This activity is carried out to improve the character of responsibility, preparedness, and self-sufficiency of students, to anticipate falling victim to children.

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