

Digital Media in Disaster Mitigation Related to the Eruption of Mount Merapi for Elementary Students Living on the Slopes of Mount Merapi in the Special Region of Yogyakarta

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Abstract: Merapi is one of at least 129 active volcanoes in Indonesia and part of the Pacific “Ring of Fire” which is a series of fault lines stretching from the Western Hemisphere through Japan and Southeast Asia. The 2,914 m volcano which last erupted 12 years ago has shown heightened activity in recent days, spewing dust from its crater and occasionally sending out streams of lava. Merapi’s last major eruption was in 1994 when heat clouds killed more than 60 people and 6,000 others were forced to evacuate. It also, erupted in 1976, killing 28 people and leaving 1,176 people homeless. The purpose of this research is to develop digital media to be used in disaster mitigation related to the eruption of Mount Merapi for elementary students living on the slopes of Mount Merapi. Disaster mitigation is a series of efforts to reduce the risk of disaster, through physical development, awareness and capacity building to deal with the threat of disaster. Disaster mitigation is an activity that serves as an action to reduce the impact of a disaster or an effort undertaken to reduce the number of victims when a disaster occurs including both casualties and property. The results of the initial needs analysis show that there is a need for digital media in disaster mitigation to be used in early learning by elementary school students.

Key words: Digital media, Mount Merapi, Gegana, mitigation disaster, casualties, elementary school

INTRODUCTION

Geographically Indonesia is an archipelago situated at the intersection of four tectonic plates, namely the plates of the Asian continent and Australian continent and those of the Indian Ocean and Pacific Ocean. Indonesia has 130 active volcanoes with more than 5,000 rivers and small streams that flow through densely populated areas and have the potential to cause floods, landslides and volcanic eruptions. As a disaster prone area, Indonesia needs to improve the ability and awareness of the community to manage and reduce the risk of natural disasters. Efforts to improve the ability and awareness of the community are evident in one of the targets of disaster management in the third Medium Term Development Plan (2015-2019), namely to reduce the risk of casualties, potential damage and loss through increased awareness and understanding of the community and by creating a culture of awareness and safety in the community in the face of disaster.

One of the greatest potentials for natural disaster is on the slopes of Mount Merapi, a volcano located in the Magelang Regency of Central Java, Indonesia. The eruption of Mount Merapi in the Magelang Regency is a

disaster that occurs periodically every 5 years (Suryo and Clarke, 1985). The 2010 eruption of Mount Merapi resulted in large loss of life and countless damage. The death toll from the eruption continued to increase for many days. Based on data collected by the National Disaster Management Agency (Pusdalops) as of 18 November 2010, the death toll was 275 people. This condition must be given serious attention by all elements, not only the government, in order to educate the community in its attitude towards disaster response, so that, casualties can be minimized. “The mission of the US Geological Survey (USGS) Volcano Hazards Program (VHP) under the Disaster Relief Act (P.L. 93-288) is to enhance public safety and reduce losses from volcanic events through effective forecasts and warnings of volcanic hazards based on the best possible scientific information”.

The disasters caused by the periodic eruption of Mount Merapi have a negative impact on the sustainability of the activities of people affected by the eruption. Therefore, efforts need to be made to increase understanding and awareness about disaster response from an early age. Virtually all community activities are paralyzed after the eruption of Mount Merapi and this includes the world of education. If not given serious

attention, this condition will affect the children living in this area, children who incidentally are part of the next generation responsible for determining the future of the nation (Bird, 2009). One way in which children, especially, elementary school students can be made aware about the danger of Merapi is to create disaster mitigation learning media related to Mount Merapi. This media can offer an alternative way for providing knowledge and understanding about the dangers of Merapi and about how to behave or respond to overcome disaster when it happens. This media can be used as an additional supplement in elementary school learning because of its relevance to the theme of disaster.

The education most urgently needed by children living on the slopes of Mount Merapi is knowledge of disaster mitigation in relation to the eruption of Merapi. Disaster management is a series of activities carried out before, during and after a disaster, to help prevent, reduce, avoid and recover from the impact of the disaster (Shiwaku *et al.*, 2007). In general, the activities undertaken in disaster mitigation/management are as follows: prevention, hazard reduction, preparedness, emergency response, recovery (rehabilitation and reconstruction) and sustainable development that reduces disaster risk.

Therefore, the most appropriate form of education is to provide props or media-media that can be developed by utilizing inventory application technology in android gadgets. The digital media for this disaster mitigation movement is a blend of audio and visual media. According to Sayudi *et al.*, audio visual media is media that combines the two elements of sound and image. This media has great benefits because it has two functions, namely the auditory function (listening) and visual function (view). The development of this media is expected to facilitate the application of learning about disaster mitigation for children on the slopes of Mount Merapi.

Based on observation in the field, it is evident that there is a lack of adequate facilities and infrastructure for continuing the education of children living on the slopes of Mount Merapi and especially, a shortage of learning media for elementary school students. In the midst of the difficult conditions that arise after the eruption of Mount Merapi, it is even more important that education for children continues to take place in order to ensure a contribution to the intellectual life of the nation (Panic *et al.*, 2013; Anjasni, 2013). Elementary students on the slopes of Mount Merapi in the Magelang Regency need learning media which is fun and interesting and which is audio-visual based, to make the children more enthusiastic about learning.

The development of disaster management is an integral aspect of sustainable national development. In order to realize the long-term development goals of 2005-2025, the target of disaster management in the national development of the next 20 years is directed towards: realizing a society that is cultured and civilized based on the philosophy of Pancasila, realizing a competitive nation, establishing democracy based on law, realizing Indonesia as a safe, peaceful and united nation, realizing equity in development and justice and realizing a beautiful and sustainable Indonesia.

The realization of a beautiful and sustainable Indonesia is an appropriate target. The development described above is carried out by paying attention to and developing a conception of the environment which includes developing the skills needed to implement early detection as well as socializing and disseminating information to the community about the threats and potential of natural disasters, especially, to primary school children at as early an age as possible. In addition, it is necessary to identify and treat all disaster-prone areas included in the planning as disaster sensitive areas. Media is a communication channel or tool. The word media is derived from the Latin language and is the plural of the word medium which literally means an intermediate or intermediary between a source message (source) and a recipient (receiver). In college learning, students not only act as communicants or recipients of messages but may also act as communicators or messengers. In other words, it is hoped that two-way communication and even multi-way communication will occur in the learning process. The communication of learning requires the role of media to further improve the level of effectiveness in the achievement of goals/competencies. The learning media developed in this research is a learning media created by utilizing inventory application technology in android gadgets. With the development of this media students are expected to be more motivated in the learning process. The use of instructional media is not an additional function but it has its own function as an aid to achieve a more effective learning situation. Learning media is an integral part of the learning process as a whole. This implies that the instructional media is a component which is not independent but rather interconnected with other components in order to create the desired learning situation. The benefits of instructional media are as follows: making abstract concepts more concrete, presenting an object that is too dangerous or difficult in the learning environment; displaying an object that is too big or small such as for the purpose of explaining an aircraft, ship, temple,

bacteria, virus and showing movement that is too fast or slow such as the trajectory of a bullet or arrow using slow motion technique in a video.

Disaster mitigation is a series of efforts to reduce disaster risks, both through physical development and by increasing awareness and capacity for dealing with the threat of disaster. Disaster mitigation is an activity that serves as an action to reduce the impact of the disaster or an effort undertaken to reduce the number of victims when a disaster occurs including both casualties and property. When carrying out disaster mitigation, the first step is to conduct a disaster risk assessment. In order to do this, it is necessary to know the hazards, vulnerability and capacity that exist. The digital media for this disaster mitigation movement is a combination of audio and visual media. The presence of this media is especially, needed for elementary students who still think in a concrete manner. This is in line with what Piaget says about the theory of learning, namely that children of elementary school age are still in the concrete operational stage. According to Sayudi *et al.*, audio visual media is a media that combines the two elements of sound and image. This media is highly beneficial because it has two functions, namely the auditory function (listening) and the visual function (view). Digital Media for the Disaster Mitigation Movement (abbreviated to "Metal Gegana") contains the action that needs to be taken to deal with the forms of disaster that often appear on the slopes of Mount Merapi.

This media will be used in elementary schools where there is generally still a lack of understanding about the danger of the disasters that often appear on the slopes of the mountain. The advantage of Metal Gegana is that the media is highly suited to various fields of elementary education including Natural Sciences, Social Sciences and the Indonesian Language and can be utilized in group learning in the classroom and in individual study. Metal Gegana is important because children today are constantly spoiled with gadgets and television shows that have a great impact on their lives. It is hoped, therefore, that the presence of this media will help children develop an appropriate attitude or response to the disasters that often appear on the slopes of Mount Merapi (Kusumayudha, 2012).

Metal Gegana contains videos which show the necessary action that must be taken at the time of an eruption of Mount Merapi. Elementary school children in particular can use this media to learn about the steps that need to be taken in such events and it will be useful for them, if another disaster occurs on Mount Merapi in the future. Metal Gegana also, contains videos showing the signs of a disaster, videos taken during a disaster and videos of the situation after a disaster. This media is very

useful for helping to identify the signs of disaster on the slopes of Mount Merapi, so that, disaster can be recognized as early as possible (Mei *et al.*, 2013). In addition, to showing the signs of disaster, Metal Gegana also, contains a video explaining what to do in the event of a disaster as well as what needs to be prepared after a disaster has occurred.

Based on the background described above, a study was conducted to analyze the needs of digital media in the disaster mitigation movement, in particular for elementary students on the slopes of Mount Merapi in the Magelang Regency. This research was carried out as a basic study to investigate the development of Metal Gegana (Digital Media Movement of Disaster Mitigation) for elementary school students on the slopes of Mount Merapi in the Magelang Regency of Central Java, Indonesia.

MATERIALS AND METHODS

The research method used in this research was descriptive qualitative. The study began with an identification of the problems of elementary school learning on the slopes of Mount Merapi in the Magelang Regency of Central Java, Indonesia. The purpose of this was to obtain data about the media needs for elementary school learning. The next stage was to compile and distribute questionnaires about the needs of learning media for elementary students. The questionnaires were used as a tool for collecting data for the purpose of a media needs analysis. The questionnaires were distributed to teachers and students. Specifically the subjects of this study were 65 students from two elementary schools located on the slopes of Merapi.

RESULTS AND DISCUSSION

The results were based on the questionnaire distributed to elementary school teachers on the slopes of Mount Merapi in the Magelang Regency. The questionnaire contained a profile of elementary school learning and a profile of digital media for the disaster mitigation movement (Metal Gegana). The subject matter of lesson 8 sub-theme 4 on natural disasters is material which is taught in class I. This material on natural events is integrated in the subjects of PPKn (Civil studies and Pancasila), PJOK (physical education, sport and health), Bahasa Indonesia (Indonesian language), SBdP (culture, arts and crafts) and Mathematics. Based on the class I teacher's textbook, the specifications of this material are shown in Fig. 1.

Competency mapping was obtained from the elementary school text books which follow the 2013

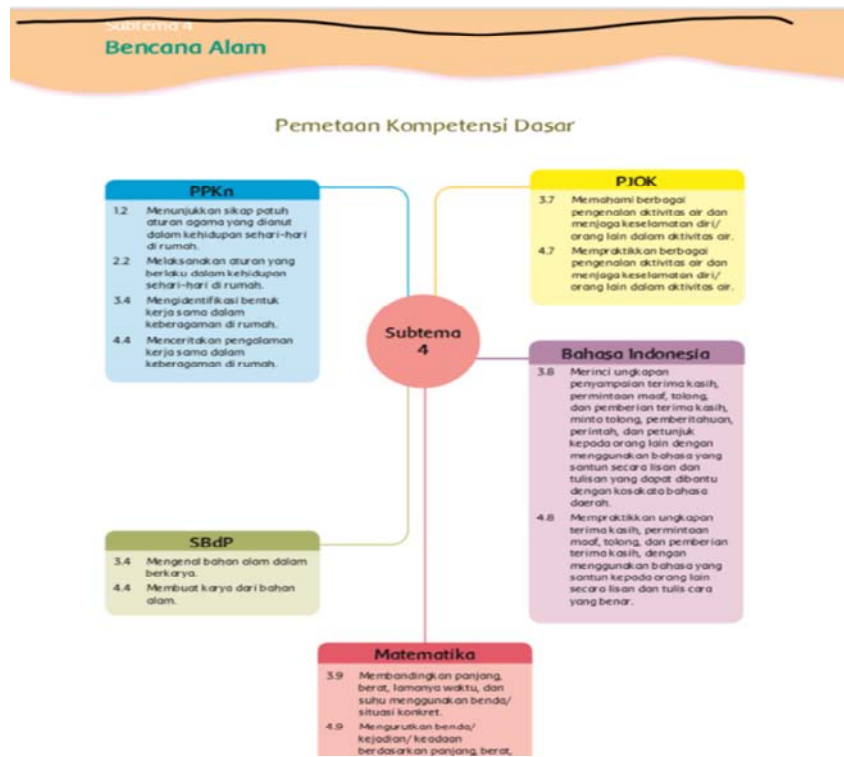


Fig. 1: Mapping of basic competency

curriculum implemented in Indonesia. The sub-theme of disaster is included in the subjects of PPKn, PJOK, SBdP, Bahasa Indonesia and Mathematics. Based on the questionnaire given to the teachers, it was found that in the learning process, teachers have difficulty in teaching the material on natural events because of a lack of media in the field specific to the material. In the learning process, teachers usually use visual media or images to deliver the material but they consider this method to be ineffective because of its abstract nature. Instead, teachers would prefer a more real media to deliver the material related to natural events. Teachers believe audio-visual media to be an alternative solution for making the material about natural events more real because it is more interesting and fun for the students and easier for the teachers to deliver the material because they can show videos. However, in the Magelang Regency, this type of media is still difficult to obtain or does not yet even exist. The Merapi volcano disaster is synonymous with the Magelang Regency and for this reason, teachers in the Magelang Regency need more specific media about natural disasters and especially, volcanic eruptions which is more useful compared with other natural events.

Elementary school teachers in the Magelang Regency, especially, class I teachers who teach about natural events with sub-theme 4 on natural disasters are

in need of digital media based on the disaster mitigation movement, specifically relating to the volcanic eruptions that occur periodically in the Magelang Regency as 5 years events. This would enable them to perform demonstrations, so that, the students would have a better understanding about the correct attitude to disaster response, especially, in relation to the natural event of a volcanic eruption. The results of the teacher's questionnaire about the needs analysis of digital media for disaster response for the sub-profile of learning in elementary school class I can be described as follows: for the indicator of disaster material content in learning, the teachers answered yes 95%, no 3%, do not know 2%, for the indicator of constraints in learning disaster material, the teachers answered yes 98%, no 1.5%, do not know 0.5%, for the indicator of disaster material implementation in fun learning, the teachers answered yes 10%, no 85%, do not know 5%, for the indicator of illustration of disaster material in learning, the teachers answered yes 87%, no 7%, do not know 6%, for the indicator of support facilities in disaster learning, the teachers answered yes 10%, no 88%, do not know 2%. A recapitulation of the results of the questionnaire about the teacher's needs analysis of digital media for the disaster mitigation movement can be seen in Table 1.

Table 1: Recapitulation of questionnaire results about teacher's needs analysis of digital media for the disaster mitigation movement

Indicators	Teacher's response (%)		
	Yes	No	Don't know
Disaster material content in learning	95	3.0	2.0
Constraints in learning disaster material	98	1.5	0.5
Disaster material implementation in fun learning	10	85.0	5.0
Illustration of disaster material in learning	87	7.0	6.0
Support facilities in disaster learning	10	88.0	2.0

Table 1 shows clearly that based on the questionnaire about the teacher's needs for digital media in the disaster mitigation movement, the indicator of constraints in learning disaster material has the highest percentage of 98%. Based on the results of a detailed analysis of the questionnaire about teacher's needs in relation to the constraints encountered, it was found that this was due to a lack of understanding amongst teachers working on the slopes of Mount Merapi, since, they are limited in their management of disaster learning material contained in the digital media. For the indicator of disaster material content in learning, the result of 95% is only slightly below the 98% in the indicator of learning constraints. This shows that the mapping of disaster material related to digital media is still the main difficulty encountered by the teachers on the slopes of Mount Merapi. For the indicator of illustration of disaster material in learning, the result is also high, thus, showing the need for the development of this media. The teacher's explained in detail that the development of illustrative material to be used in learning which combines real events with the application of media, is also a difficult category. For the indicators of implementation of disaster material in fun learning and support facilities in disaster learning, there are no significant problems, since the teacher's answers showed only 10 % for this category. Figure 2 shows that the primary need for developing digital media for disaster mitigation lies in the mapping of disaster material in learning, the constraints of disaster material in learning and the development of illustrations for disaster learning. These results can be used as a preliminary foundation for developing further digital material for disaster mitigation in the Metal Gegana program.

The media profile of the disaster mitigation movement expected by the teachers has the following specifications: a video which can be displayed in the classroom and seen clearly can be used for a long time and not easily become damaged is accompanied by background music, so that, the audio visual media developed can be used for learning, especially, for teaching about natural events to class I elementary school students. Based on the questionnaire completed by elementary school teachers

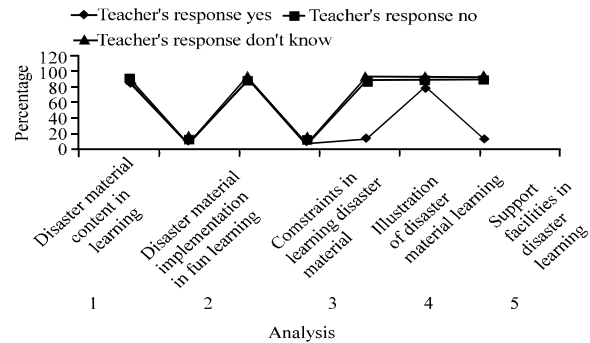


Fig. 2: Media needs analysis for teachers

in Srumbung Sub-Regency of Magelang, it was found that the digital media profile for the disaster mitigation movement was expected to begin with the definition of disaster and equipped with an example of the natural disaster of a volcanic eruption, complete with cold lava floods and heat clouds (wedhus gembel) using a variety of words that are suitable and easy for children to understand and pictures that are bright but do not make the eyes sore.

The other results of this research study were based on the questionnaire given to elementary students on the slopes of Mount Merapi in the Magelang Regency. This questionnaire contained a learning profile for elementary school students and a digital media profile for the disaster mitigation movement (Metal Gegana). A recapitulation of the questionnaire results about the student's needs for digital media for the disaster mitigation movement can be described as follows: for the indicator showing the need for elementary school learning media, the student's response was yes 85%, no 3%, do not know 12%, for the indicator of teacher's presentation of learning material, the response was yes 18%, no 68%, do not know 14%, for the indicator of student's understanding of material about natural disasters, the student's response was yes 11%, no 80%, do not know 9%, for the indicator of interest in the learning model for natural disasters which is understood by the students, The model of learning of elementary school teachers, student responses that say yes 10%, not 77%, do not know 13%. The recapitulation of the questionnaire results of the student's needs analysis is presented in Table 2.

Table 2 shows clearly that the student's needs for digital media in disaster mitigation in schools on the slopes of Mount Merapi lie in other indicators which show that 18% of students stated a need for teacher's presentation of learning material, 11% stated a need for understanding of material about natural disasters presented by the teacher and 10% stated an interest in the learning model used by the teachers. This clearly

Table 2: Recapitulation of results of student's needs analysis of digital media for the disaster mitigation movement

Indicators	Student's response (%)		
	Yes	No	Don't know
Need for disaster learning media in elementary school on the slopes of Merapi	85	3	12
Teacher's presentation of learning material	18	68	14
Student's understanding of material about natural disasters	11	80	9
Interest in the learning model of elementary school teachers	10	77	13

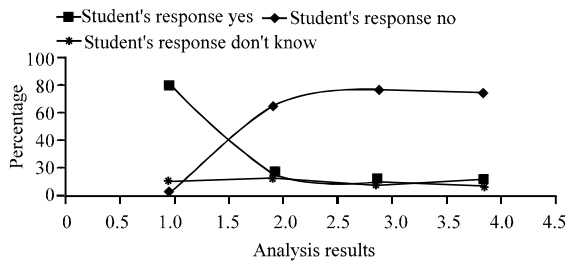


Fig. 3: Recapitulation of student's needs analysis results of digital media for the disaster mitigation movement

shows that the primary need of students in schools on the slopes of Mount Merapi is for digital media related to the disaster mitigation movement. Students explained in more detail that the digital learning media should be developed by the teachers in order to increase their understanding of the disaster mitigation that is integrated in their learning but that at the present time, teachers have not yet developed this media. This preliminary needs analysis, carried out through questionnaires and observation will be used as a basic concept for developing the Metal Gegana media. The recapitulation of the results of the student's questionnaire about the need for digital media for the disaster mitigation movement in the learning profile of class I elementary school students can be seen in Fig. 3.

CONCLUSION

Based on the results of the needs analysis in this research study, it can be concluded that the learning material about natural events in theme 8 sub-theme 4

about natural disasters is material which is taught in class I. This material about natural events which is integrated in the subjects of PPKn, PJOK, Bahasa Indonesia, SBdP and Mathematics, still requires a more interesting and enjoyable learning media for teachers and students. More specifically, the learning media needed is digital-based media for the disaster mitigation movement with disaster material that is suitable for elementary students, especially, students living on the slopes of Mount Merapi in the Magelang Regency.

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