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# MICHARUMI (Minibook Keychain Eruption Mitigation) as a Map Based Eruption Mitigation Guide Book for Senior High School

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**Abstract.** One of the most active volcanoes in Indonesia and even in the world is Mount Merapi, which is located in the Special Province of Yogyakarta and Central Java Province. Merapi Volcano eruption has been going on since 1000 AD with a span of once in a period of 1-7 years and a period of inactivity of a maximum of 12 years. Knowledge of disaster mitigation among students is expected to be able to build preparedness. Student preparedness is built to minimize casualties. One effort to build student preparedness is to use a map-based mitigation guide. This study aims to produce MICHARUMI (Minibook Keychain Eruption Mitigation) as a Map-Based Eruption Mitigation Handbook for High School Students. This study uses the RnD (Research and Development) research method which is adapted from the Sugiono development model. The result of this work is a small book that has hangers and contains about eruption mitigation, evacuation steps, and evacuation path maps, so this book can be an easy-to-use guide during critical situations.

## 1. Introduction

Indonesia has many volcanoes, namely 129 active volcanoes, or about 15% of all volcanoes on the earth, which are generally Strato type with intermediate rock composition, there are craters or lava domes between 2000-3000 m above sea level, 70 of which are categorized as very threatening (Zamroni. 2011: 1). One of the most active volcanoes in Indonesia and even in the world is Mount Merapi, which is located in the Special Region of Yogyakarta and Central Java Province. Merapi Volcano eruption has been going on since 1000 AD with a span of once in a period of 1-7 years and a period of inactivity of a maximum of 12 years [1]. The eruption of Mount Merapi in 2010 caused more than 350 lives to die, agricultural land and houses destroyed.

Build preparedness of students who live or study in areas that are prone to eruption of Mount Merapi, does not mean teaching them to reject or resist the threat of Mount Merapi eruption, but teach efforts that can be done to anticipate and understand that students should not ignore risks and preparedness, because in each student has the potential strength that can be used as social capital to develop strategies in the face of the impending threat of the eruption of Mount Merapi. Knowledge of disaster mitigation among students is expected to be able to build student preparedness. Student preparedness is seen as something that consists of activities aimed at increasing response activities, directing all efforts to achieve the desired goals, think strategically, be able to overcome and control stress, and minimize the occurrence of casualties [2].



SMAN 1 Cangkringan is located on Jl. Merapi Golf Bedoyo, Wukirsari Village, Cangkringan Sleman District. SMAN 1 Cangkringan is a school located in the Disaster Prone Region (KRB) III, which is the most dangerous area. Based on information from the Head of SMAN 1 Cangkringan, 95% of students of SMAN 1 Cangkringan were displaced, and 30% of homes in Cangkringan District suffered severe damage due to hot lava and rain lava, and there were five people who died from the families of students. After the eruption of Mount Merapi 2010, aftershocks continued to occur until 15 July 2012, 22 July 2013 and 18 November 2013[2].

The above conditions indicate that SMAN 1 Cangkringan needs to obtain comprehensive and clear information on disaster mitigation related to the eruption of Mount Merapi. The author offers a solution in the form of a minibook keychain eruption mitigation guidebook that is easily stored and used when the situation is critical. Minibook map-based eruption mitigation keychain makes it easier for users to evacuate to safer locations.

## 2. Literature Review

Volcanic eruption according to Law No. 24 of 2007 is part of volcanic activity known as "eruption". The danger of volcanic eruptions can be pyroclastic flows, material throws (incandescent), heavy ash rain, lava, poison gas, tsunamis and lava floods. According to [3] eruptions or volcanic eruptions are one of the most spectacular natural events. Volcanic eruption is the release of lava, gas and other materials from inside the earth's skin to or reach the surface and atmosphere of the earth. The nature and type of eruption is influenced by composition, viscosity, and pressure of magma gas, pipe shape, and crater holes, rock structures around the crater, material released (pyroclastic material), as well as the center of the eruption.

According to Law No. 24 of 2007 disaster mitigation is defined as an appropriate planning effort to minimize the negative impact of disasters on humans. Disaster mitigation is one of disaster management activities, which includes: (1) pre-disaster activities, namely activities of prevention, mitigation, preparedness, and early warning; (2) activities in the event of a disaster, including emergency response activities, SAR activities (search and rescue), emergency assistance, and evacuation, and (3) post-disaster activities that include election, rehabilitation and reconstruction activities (Suparmini et al, 2014: 49) . In this study the form of learning about disaster mitigation includes pre-disaster activities, but the content of disaster mitigation on the media is not only pre-disaster activities but also includes activities in the event of disasters and post-disaster activities. Mitigation actions consist of passive mitigation and active mitigation. Passive mitigation is in the form of developing actions such as building regulations, land use, urban spatial planning, installation of signs and alarms. Active mitigation includes actions that require direct contact with the population, namely through social counseling, house restoration, relocation of people from disaster-prone areas to safe areas. Active mitigation will not function without passive mitigation [4].

Map is a means of information (spatial) about the environment. Mapping is a process of presenting facts of the earth (real world), both the shape of the earth's surface and its natural axis, based on map scale, map projection system, as well as symbols from the elements of the earth presented (Jatmiko, 2011). According to the Big Dictionary of Indonesian Language Mapping is a process, a way, an act of making a map. According to [5] digital mapping or often referred to as digital mapping is a way of making maps, both for printing purposes and in digital map format.

Keychains according to the Big Indonesian Dictionary are tools for hanging keys, made of wood, plastic, or metal, various shapes. Meanwhile, according to [6] Judging from the word, a mini book is a small book or mini book consisting of several interesting facts for a particular language topic. Mini book is one of the writing media for students. Early class students like to talk about themselves, the topics they talk about vary, from the things they like to what they don't like. It can be poured into the writing media, namely a mini book. Mini books can also be juxtaposed with the big book so after reading the big book together students can make mini bok related to the same topic as the big book.

The advantage of this Mini Book Keychain is that it is the basis of the researcher to create a guidebook in the form of a Mini Book Keychain in the hope that the material or content to be submitted can be

easily accepted and used by high school students. The Mini Book Keychain that will be created by the author is a guide book designed in the form of a key chain containing an evacuation route map in accordance with evacuation procedures that are adapted to disaster mitigation material.

### 3. Material dan Metodology

This study uses a type of research and development (R & D), with product development in the form of a map-based eruption mitigation manual, namely Mini Book Keychain Erupion Mitigation (Micharumi). The subjects of this study were students of SMAN 1 Cangkringan and the object of this study was a manual for eruption mitigation. This research was conducted at SMAN 1 Cangkringan, Bedoyo, Wukirsari, Cangkringan, Sleman, Yogyakarta Special Region. This research was carried out within 4 months.

In this study, researchers refer to the research and development model (Research and Development) according to Sugiyono (2012: 298) which consists of several steps including potential and problem stages, data collection, product design, design validation, product design revision, product testing, product revision, usage test, product revision, and mass production. The material is in the form of mini books, key chains, and evacuation maps.

No.	Score in percent (%)	Criteria
1.	< 21 %	Sangat Tidak Layak
2.	21 – 40 %	Tidak Layak
3.	41 – 60 %	Cukup layak
4.	61 – 80 %	Layak
5.	81 – 100 %	Sangat Layak

**Table 1.** Media Eligibility Criteria

## 4. Result and Discussions

### 4.1. Preparedness to Face Eruption

Based on observations that have been made through literature studies and the field obtained various information about the condition of the school it is known that SMAN 1 Cangkringan is a school located in disaster prone areas. The location of the school is in an eruption-prone area, this is a threat to students and teachers when the learning process takes place. The school feels that preparedness in the face of eruption is still lacking, this is because the eruption socialization and simulation of the authorized institutions has not been maximized. In addition, the evacuation route in an emergency situation is not yet known as a whole by students, teachers and school employees.

BPBD (Regional Disaster Management Agency) as a regional government agency that carries out the task of disaster management has conducted socialization of high school students, especially students of SMA 1 Cangkringan. The socialization provided by BPBD according to the school is still not successful in providing knowledge about the mitigation of the catastrophic eruption of Mount Merapi because socialization is given only to representatives of one generation. These conditions cause students who have skills in evacuation and have knowledge of disaster mitigation have graduated and no longer study in high school, it makes new students and other generations who do not get socialization lack understanding in dealing with eruptions.

On May 11, 2018 there was a phreatic eruption of Mount Merapi. Phreatic eruption is a sudden eruption. This phreatic eruption makes students and teachers panic, the teacher then dissolves the learning activities and the students are directed to go home. After the phreatic eruption of Merapi on May 11 2018, the school made an emergency parking location policy. The parking location that was previously far from the main gate and was behind the classroom building was moved. The school directs students to park in the front yard and on the volleyball court which is located close to the gate and is faster to get to the road which is the evacuation route.

#### 4.2. Development of Guidebooks

Mitigation guidebooks have been developed using Sugiyono's R & D method with analysis steps, information conclusions, product design, product validation, and product trials. Based on the steps that have been taken, the results are obtained:

No.	Expert	Score	Category
1.	Material Expert	82	Worthy
2.	Media Expert	79	Worthy

**Table 2.** results of assessment of Material Experts and Media Experts

Variation	Students	Average	Score	
			Lowest	Highest
Pre test	5	6,9	6	7,5
Post test	5	8,1	6,5	8,75

**Table 3.** results of product trials

Based on the data above, it is known that the average ability at pre test obtained a value of 6.9 and the average value of post test obtained a value of 8.1. With the results of testing the product obtained 95% confidence level. The difference in mean values shows that there are differences in abilities before and after treatment.

The development of guidebooks based on existing needs at the school, given the location of schools located in disaster-prone areas and the condition of students who do not yet have an understanding of eruption mitigation and evacuation independently. Based on this, this guidebook is the right solution for erupting disaster risk reduction.

#### 5. Conclusion and Recommendation

Preparedness of school residents must be built because the school is located in a disaster prone location. Schools are still lacking in preparedness to face eruptions and students do not have the skills needed to carry out an independent evacuation when a disaster occurs.

The guidebook is the right solution to improve students' preparedness in evacuation independently and can build a culture of safety in schools so as to reduce the risk of catastrophic eruptions.

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