Multimedia in Disaster Risk Reduction

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Abstract. This research aims to find out the comprehension in disaster risk reduction for students of Class IV and analysis the needs of learning media to improve the comprehension in disaster risk reduction. This research applies survey method. Subjects used in this research are teachers and students of Class IV at Sekolah Siaga Bencana in Cangkringan District, Sleman, Yogyakarta, Indonesia. Interview, test, questionnaire, and literature review are used for the data collecting techniques. The research results present that comprehension of the material of Disaster Risk Reduction of elementary Class IV has note fully well. The data presents: 63.09% - poor, 12.02% - pretty good, 18.45% - good, and 6.44% - very good. The research results that the attractive learning media are needed to improve the student’s comprehension. Multimedia is a kind of learning media, which has interactive space between the users and media. Through multimedia, students will learn the concept and strategy to reduce geological disaster risk. Therefore, applying multimedia in learning process has a potency to improve the comprehension of the reduction of disaster risk for students.

Keywords: Multimedia, Disaster; Risk reduction.

1. Introduction

Indonesia is one of global countries located in disaster-prone areas. This condition can be observed based on the geological location of the region. Geologically, the territory of Indonesia is at the meeting of three active plates namely the Pacific Plate on the East side, the Indo-Australian Plate on the south side, and the Eurasian Plate on the north side. The three plates move and collide each other, so they can cause hazards such as earthquakes, increased volcanic activity, and faults. The existence of the earth plate can certainly have a negative impact and a positive impact on the area in which it passes. The negative impact of the area traversed by the earth's plate becomes a focus, which must get special attention. Based on disaster statistics in Indonesia listed on the website of the National Disaster Management Agency (BNPB), in 2016 various types of disasters have occurred in Indonesia. Table 1 describes in detail the disaster data that occurred during 2016.

The data show that disasters are a major threat for human safety. The existence of Republic of Indonesia Law no. 24 concerning Disaster Management and Republic of Indonesia Law No. 26 of 2007 concerning Spatial Planning, is expected to change the paradigm of disaster risk reduction by focusing more on prevention efforts. It is widely recognized that education plays an important role in efforts to reduce the impact of disasters. It was reinforced by the 2005 World Conference on Disaster Reduction in Japan, which identified five Hyogo Framework for Action (HFA) actions, in the third point explaining the use of innovation, knowledge, and education to develop a culture of safety and resilience at all levels [1].
Table 1. Statistic Data of Disasters in 2006

| Kinds of Disaster                  | Amount of Occurrence | Death and Loss | Injured | Suffering and Evacuating | Heavy Damage House | Fair Damage House | Light Damage House | Submerge d House | Educational Facility |
|------------------------------------|----------------------|----------------|---------|--------------------------|--------------------|------------------|-------------------|------------------|---------------------|
| (1)                                | (2)                  | (3)            | (4)     | (5)                      | (6)                | (7)              | (8)               | (9)              | (10)                |
| Flood                              | 23                   | 4              | -       | 88.138                   | 118                | -                | 63                | 8.340            | 7                   |
| Flood and Earthquake               | 2                    | -              | -       | 121                      | -                  | -                | -                 | -                | -                   |
| Erosion                            | 1                    | -              | -       | 96                       | 92                 | 85               | 516               | -                | -                   |
| Earthquake                         | 2                    | 4              | -       | 92                       | 85                 | 516              | -                 | -                | -                   |
| Land & Forest Fires                | 7                    | -              | -       | -                        | -                  | -                | -                 | -                | -                   |
| Volcano                            | 1                    | -              | -       | 14.034                   | -                  | -                | -                 | -                | -                   |
| Tornado                            | 41                   | 1              | 6       | 1.140                    | 193                | 47               | 426               | -                | 5                   |
| Landslide                          | 16                   | 12             | 6       | 1.290                    | 186                | 207              | 61                | -                | -                   |
| Total                              | 93                   | 17             | 16      | 104.819                  | 594                | 339              | 1.076             | 8.340            | 12                  |

Education is one of the effective tools used to provide socialization on the education of disaster risk reduction. One of implemented effort is integrating the material of disaster risk reduction on lesson content. Education for disaster risk reduction in schools, which is appropriate for students, families, and communities should help students develop a culture of safety against disasters in society, and it can involve non-formal activities in the form of action, not just knowledge [2]. The success of education of disaster risk reduction can be determined based on aspects of knowledge, skills and attitudes. Education of disaster risk reduction in Indonesia needs to be taught with an appropriate approach to introduce disaster risk reduction to the community as an early warning system [3]. This is supported by the results of research proving that children's participation can have positive results in the phase of rescue, relief and rehabilitation of disasters [4]. Both of these studies show the importance of education for reducing risks to disasters.

Education of disaster risk reduction should be followed up since the Indonesian’s understanding to the importance of disaster risk reduction is still low, and it can be analyzed form the data on Table 1. It finds out many casualties. Ideally, to carry out the education of disaster risk reduction, it should provide a supportive learning tool. It may be tackled by several approaches namely book based, pilot project, central-competence based, certain developed fields, symbiosis, special events approach [5].

Availability of learning tools such as multimedia can be used as supporting learning resources and teaching materials for the education of disaster risk reduction. This multimedia does not limit the teacher's creativity in teaching. Besides, it contains knowledge and concepts of disaster risk reduction, which are systematically arranged. Illustration of phenomena displayed in multimedia and student activity sheets can help students to understand the material comprehensively. Multimedia can be used for a source and a tool of learning for elementary school students as education on risk reduction for disasters.

The understanding of the Indonesian regarding disaster risk reduction should be further studied. Disaster risk reduction as a systematic development and implementation of policies, strategies and practical activities to minimize vulnerabilities and risks of natural disasters throughout the community and avoid (prevention) / to limit negative impacts (mitigation and preparedness), within the scope of broad sustainable development [6]. Disaster Risk Reduction (DRR) means the development and implementation of policies, strategies and practices to reduce vulnerability and risk of natural disasters throughout the community [7]. The term disaster risk management is used as an abbreviation referring to all strategies, policies and collective organized activities aimed at reducing the impact of disasters and / or reducing current and creating future
disaster risks [8]. Based on the previous explanation, it is well understood that Disaster Risk Reduction (DRR) is all efforts to develop and to implement policies, strategies and practices to minimize vulnerabilities and risks of natural disasters throughout the community by prioritizing and strengthening early warning, preparedness, mitigation and prevention.

Disaster risk reduction must be undertaken systematically in the curriculum and through the grade level, which contains hazard basics and security procedures to consider the prevention, mitigation, vulnerability and resilience of buildings [5]. The curriculum is one of the strategic tools in an educational program that is strategic because the curriculum has a direct influence on the success of achieving educational goals. The curriculum serves as a guideline for selecting and preparing materials / materials, learning strategies, learning resources, media, and tools. There are many opportunities to integrate disaster risk reduction material, which can be observed in Figure 1 below [9].

![Figure 1. An Integration of Lesson Contents](image)

The above Figure 1 presents that the incision among the lesson contents in a curriculum giving a chance to add materials of disaster risk reduction on a certain lesson. The material content of Disaster Risk Reduction (DRR) can stand as an independent subject, but often the concept of DRR is taught by combining certain parts or chapters from other content, for example the content of environmental studies, geography, science, etc. [10]. The overall curriculum has the potential to open up the possibility of integrating DRR material in and in all or most of the content of the lesson [5]. Based on this explanation, it can be formulated that material for disaster risk reduction can be integrated in the content of science or the lessons of social studies in the curriculum, and can also stand independently as a local content material. The focus that must be considered is the arrangement of learning activities must be designed with regard to other learning tools.

Media have an important role as learning devices. The media used in learning activities are known as learning media. In simple terms, learning media can be interpreted as a means to convey learning messages [11]. Interactive multimedia is one type of learning media that can be used as an alternative. Interactive multimedia is a multimedia design, which is arranged in order to fulfill the function of informing the message and to have interactivity with its users [12]. Interactivity, which is presented in multimedia can stimulate and defy, so students will perceive that learning is attractive, fun, and more profound [13,14].

Multimedia consists of various types of media, including text, images, animation, sound, and video. Each component supports one another as a whole. The use and effectiveness of animation can be developed to enhance key concepts, [15]. Games or Quiz can be added to complement interactive multimedia features. Educational games can provide discussion space between students and stimulate concepts that have been studied [16]. This explanation is reinforced again that with the Games allowing abstract concepts learned in class can be contextualized [17]. Therefore, this research aims to find out the comprehension in disaster risk reduction.
The rest of this paper is organized as follow: Section 2 describes the proposed research method. Section 3 presents the obtained results and following by discussion. Finally, Section 4 concludes this work.

2. Research Method
A survey method was applied in this research. It was conducted to find out the understanding of disaster risk reduction and the role of multimedia to improve understanding of disaster risk reduction for elementary school students in Class IV at the Disaster Preparedness School (SD Siaga Bencana) in Cangkringan District, Sleman, Yogyakarta. The subjects of this study were teachers and Grade IV students as many as 233 students. This school involved the whole SD Siaga Bencana in Cangkringan District. Data collection techniques were carried out through interviews, questionnaires, tests and literature studies. Interviews with teachers were conducted to obtain data on media needs and understanding of student disaster risk reduction. Tests were carried out to obtain data on understanding disaster risk reduction. Questionnaire was used to obtain data on students' interest in multimedia. Literature study was used to study theories and research that support multimedia use.

3. Results and discussion
This section presents the obtained results and following by discussion.

3.1 Disaster risk reduction education in SD Siaga Bencana Merapi
Based on observations, SD Siaga Bencana in Cangkringan District is fully located near Mount Merapi, which has the potential to be affected by volcanic eruptions, as well as other dangers. The predicate of Sekolah Siaga Bencana (SSB) in Cangkringan Subdistrict has not fully run as expected. During observation in class IV in eleven schools, learning activities that led to materials of disaster risk reduction were not included. It is also supported by the results of observations on documentation that have not included efforts to understand disaster risk reduction in the Learning Program Plan (RPP). Slogan and posters that are usually used as guidelines or signs are also not installed in strategic places.

The results of interviews with grade IV teachers indicate that understanding the issues of disaster risk reduction is not yet fully well, and it needs to be improved since lack of students' understanding of the material lies in disaster concepts and strategies. Based on the teacher's explanation, this material has not been taught in class, this is because the material for disaster risk reduction is not found in the teacher's book or the student's book. The limitations of material and media are a barrier for classroom teachers to teach them. During these time activities related to disaster risk reduction education were only carried out if there were representatives from the Regional Disaster Management Agency (BPBD) who provided socialization to schools. So that such activities cannot be carried out systematically and continuously. Lack of students' understanding of disaster risk reduction according to the teacher is due to various factors, one of which is the policy to carry out disaster learning has not been clearly written. The attention of educational institutions to aspects of disaster is also still deficient.

The following result of cognitive test with 10 questions conducted in eleven SD Siaga Bencana in Cangkringan District presents (see Table 2).

| Criteria            | Predicate | Range | Total (students) | Percentage (%) |
|---------------------|-----------|-------|------------------|----------------|
| Very Good           | A         | n > 90| 15               | 6.44           |
| Good                | B         | 80 – 89| 43               | 18.45          |
| Pretty Good         | C         | 70 – 79| 28               | 12.02          |
| Poor                | D         | n < 70| 147              | 63.09          |
| Total               |           |       | 233              | 100            |
The Table 2 above presents that the average student's understanding of the materials of disaster risk reduction is still not fully good. A score of 70 is obtained based on the Minimum Completeness Criteria specified by the school.

3.2 Analysis of learning needs with multimedia

To find out students' interest in multimedia uses questionnaire techniques. The questionnaire used contains 7 questions, which should be answered by students. The questions are:
1) Do you want to use a computer to study?
2) Will learning subject matter with computer-assisted media be more interesting than learning with lectures?
3) Do you want to learn to use computer-aided learning multimedia?
4) Do you prefer learning while looking at pictures?
5) Do you prefer to learn by viewing video shows?
6) Will you be more motivated to learn if you use computer-aided multimedia?
7) Are you happy, if you can study independently? The following are the students' answers to the statement (see Figure 2).

![The needs of multimedia](image)

Figure 2. The Diagram of Student’s Answers

Choosing multimedia as an attempt to support learning activities receives a good response. Students are interested in using multimedia as a tool of achieving learning goals. This shows that the use of multimedia has a positive impact to improve understanding of disaster risk reduction. Most students like learning activities that can display pictures, as well as video shows. They also show high interest when learning is conducted using multimedia.

3.3 Multimedia to improve understanding of disaster risk reduction

The importance of understanding disaster risk reduction in the world of education in Indonesia has not received any special attention; although, understanding disaster risk reduction has a good impact on students' lives. Disaster risk reduction may mean as an effort to develop & implement policies, strategies and practices to minimize vulnerabilities and risks of natural disasters throughout the community by prioritizing and strengthening early warning, preparedness, mitigation and prevention. Knowledge of good material can minimize the consequences of a disaster. One dimension in disaster risk reduction education is understanding science and natural disaster mechanisms [9]. Building students' cognitive is an effort to facilitate students in understanding the concept of hatred, as well as the characteristics of geological disasters (phenomena and mitigation). Simply put, humans can reduce the impact of disasters safely if they understand the characteristics of disasters scientifically, [18]. The problem of students' lack of understanding of disaster risk reduction that is found needs to get special attention, considering that this knowledge is needed for students living in the affected area. The findings show that, despite the fact that students in the schools studied have learned about natural disasters and prevention for years both under integrated or isolated teaching methods, there is still confusion or problems regarding their knowledge, attitudes and behavior that are effective when they
occur natural disasters [19]. This further shows the importance of disaster reduction education that is structured systematically and carried out periodically.

Based on the 2013 Curriculum, the knowledge of disaster risk reduction can be integrated in the lesson content, such as in the content of lessons such as science, language, and art [9]. The content of basic competencies in science subjects provides the opportunity for teachers to be able to develop and teach this material. In simple terms the teacher can integrate it into learning on the theme Caring for Living Beings. Teachers can start make lesson plans, which are appropriate to the material and theme. A strong foundation for attracting children's participation in disaster risk reduction education must begin with participatory methods and approaches that are child-centered, in which these activities recognize children's efforts, abilities and understanding, and respect the opinions of all children [4].

The education of disaster risk reduction needs to be shared in wider community. It must not only be limited to schools, but also must be promoted to families and communities [14]. The explanation shows the role of the environment around the child can greatly support disaster risk reduction education. In the community environment, the role of disaster agencies such as Badan Penanggulangan Bencana Daerah (BPBD) can collaborate with the Dinas Pendidikan to facilitate disaster risk reduction material in accordance with the curriculum used. In addition, disaster risk reduction education programs from BPBD can be synergized with village programs. A study shows that educating the general public through children at an early level in their education is one of the non-structural mitigation approaches that are increasingly being used in disaster mitigation strategies, as well as positive and promising results [20]. Therefore, it is natural that the education of this element gets a sufficient portion in the world of education.

Various types of learning media can be used to educate disaster risk reduction including Games, Comics, Pop-Up Books and Multimedia [21,22,23,24]. One that can be used to attract students in an effort to improve students' understanding of disaster risk reduction is by using interactive multimedia. Computer-aided multimedia integrates several types of media (images, text, animation, sound, and video) in which users can learn interactively. Technology and multimedia applications will help meet demands and enable students to interact with information in different media [25]. Through multimedia students can gain deeper knowledge through images, animation, or videos that support their cognitive processes.

The use of interactive multimedia in learning activities has great potential to provide flexibility [26]. Multimedia learning provides many opportunities for designers to develop material. Whereas from the students' point of view, they feel better with conventional teaching methods which are assisted by interactive multimedia [27]. The design of multimedia-based learning activities proved to have a positive impact. In addition, this media can combine interactivity that can be stimulating and challenging, so students will find learning that is interesting, fun, and more profound [13, 15].

Multimedia-based learning cognitively trains students in constructing their knowledge. The results show that, by assigning authentic assignments, through multimedia projects, into a constructivist learning environment, can motivate students and make students active in their learning processes and provide strong support [28]. Multimedia-based learning methods that are perfected effectively can attract students' attention, especially in the use of cartoon characters in multimedia [29]. Animations and simulations in multimedia can enhance visualization of various key concepts and principles [15]. It means that supporting media in multimedia can help students to concretize the concept of material that is abstract, so that it can support the thinking process.

Based on the previous explanation, multimedia can be an effective solution for learning. The effectiveness of multimedia and interactivity as a learning medium strongly supports the process of knowledge transfer and at the same time encourages student involvement in the learning process, [30]. This explanation is supported by evaluation results that show that interactive multimedia has the potential to support learning accurately and effectively, offering a learning environment that is more interesting and stimulating and provides support for students and teachers [31]. Therefore, interactive multimedia has the potential to increase understanding of disaster risk reduction. The multimedia presented provides an overview of concepts and strategies for disaster risk reduction. Through
multimedia students are shown how to reduce disaster risk and actions that must be taken when before, for a moment, and after a disaster.

4. Conclusion

The results of this study indicate that education of disaster risk reduction should be followed up, since the understanding of students in the disaster-prone areas of Cangkringan District on the importance of reducing risks to disasters that are still pretty good. This research also revealed the need for interesting learning media and was able to improve students' understanding of disaster risk reduction materials. Students' interest in using multimedia as one of the learning media is based on the findings of questionnaire data. It can have a positive impact that multimedia has the potential to develop understanding of disaster risk reduction. Therefore, further research is required to develop multimedia as a medium that can improve understanding of disaster risk.

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