

The implementation of android-based physics learning media integrated with landslide disaster education to improve critical thinking ability and disaster preparedness

L Rahmawati¹, U N Labibah and H Kuswanto¹

¹Physics Education, Universitas Negeri Yogyakarta, Sleman, Indonesia

Corresponding author: liarahmawati.2018@student.uny.ac.id

Abstract. The aim of this research is to improve critical thinking ability and disaster preparedness through the implementation of android-based physics learning media integrated with landslide disaster education. This research was conducted at SMA Negeri 1 Depok, Yogyakarta in April 2019 with a pre-experimental research is one group pre-test and post-test design. The research population is all students of class XI MIPA using random sampling techniques to select research sample. The sample of research are students of class XI MIPA 3 with 30 students. The variables measured are critical thinking skills and disaster preparedness. Data collection was carried out using a test consisting of 5 essay questions about the global warming to measure improvement in critical thinking ability and preparedness questionnaires to measure disaster preparedness. The result of the data analysis showed that implementation of an android-based physics learning media integrated with landslide disaster education can improve critical thinking ability and disaster preparedness.

Keywords: *media, integrated, landslide disaster education*

1. Introduction

Currently, disasters in Indonesia are increasingly prevalent, causing environmental changes and various kinds of losses. Bill McGuire, a geologist from University College London, explains that volcanic eruptions, earthquakes, tsunamis and landslides are disasters that occur due to climate change [1]. Global warming is one of the causes of climate change and occurs due to damage to nature and the environment. One of the disasters that occur due to natural damage is a landslide. Natural damage such as illegal logging and forest fires makes areas prone to landslides. The landslides that have struck are increasingly alarming so that steps are needed to prevent and anticipate when disasters occur [2]. One way to provide an understanding of natural disasters is through formal education channels [3].

Disaster risk reduction can be applied through the integration of knowledge with technology and science which are then applied in education, policy, and disaster action. The most effective means of imparting knowledge about disaster preparedness is through education by integrating material on disaster preparedness in one of the subjects in disaster prone schools [4]. Disaster education in schools in disaster prone areas makes students have a good understanding in dealing with disasters [5]. The curriculum on disaster can be integrated in school lessons that are strongly related to disaster [6], [7].

Physics is a discipline that studies the universe and its causes. Competency standards and basic physics competencies for Senior High School states that physics is part of science which is used as a basis in the development of technology in accordance with natural phenomenon. A good understanding



of physics has an effect on reducing the impact of natural disasters [8]. Integrated learning model is a learning model that combines several subject matter and comes from various fields of science [9]. An integrated learning model in disaster risk reduction material is needed because it can increase disaster knowledge and preparedness [9], [10]. The results of one of the studies that have been carried out, namely the development of integrated disaster mitigation teaching materials can be applied in learning in schools [10]. Integrated learning models in disaster mitigation improve student learning outcomes [10], [11]. One of the researches that developed a local potential-based disaster mitigation module integrated in science lessons affects student learning outcomes. Fostering students thinking skills that are inserted with natural disaster learning so that they can foster students caring attitude towards the environment [14].

Physics learning that is integrated with disaster can be done using android-based learning media with the assistance of smartphones. Learning media using the help of Science and Technology will help the learning process and achieve learning objectives. Educators' creativity is needed to develop interesting learning media and increase students' interest in learning, for example using the internet or mobile learning with the Android operating system because its use is flexible and not limited by space and time [15]. Based on the describe above, integrated android-based learning media for landslide disaster education can be applied in learning, in addition to being one of learning innovations, learning media also improves students critical thinking skills. The media can also be applied in one of the media that is integrated with landslides to increase student disaster preparedness.

2. Research method

This research was conducted at SMA Negeri 1 Depok, Yogyakarta in April 2019 with a pre-experimental research with one group pre-test and post-test design.



Figure 1. One group pretest posttest design.

where O_1 is pre-test, X is treatment or implementation of android-based physics learning media integrated landslide disaster education, and O_2 is post-test

The research population is all students of class XI MIPA which are then used random sampling techniques to select research samples. The sample are students of class XI MIPA 3 with 30 students. The variables measured in this study are critical thinking skills and natural disaster preparedness. Data collection was carried out using a test consisting of 5 essay questions about the global warming to measure improvement in critical thinking skills and preparedness questionnaires to measure disaster preparedness. Data from the pre-test and post-test results were then measured by the N-Gain value using the Normalized Gain Test to determine the increase in value from before and after treatment. The N-Gain equation can be measured using the Melzer equation [16].

$$N - Gain = \frac{\text{posttest score} - \text{pretest score}}{\text{maximum score} - \text{pretest score}} \quad (1)$$

The result of N-Gain value then interpreted according to the categories in table 1 [17].

Table 1. Classification of gain score [Hake].

Interval	Category
$g \geq 0.7$	High
$0.7 > g \geq 0.3$	Medium
$g < 0.3$	Low

3. Results and Discussion

3.1. Result

The implementation of android-based learning media integrated education of landslide disasters on the Global Warming material in class XI semester 2. Media and learning tools have been validated by expert judgment whose results are valid and are suitable for use in learning. Learning activities begin with doing a pretest to find out the student's initial knowledge about landslides. Learning activities carried out using the discussion method with the Cooperative Think Pairs Share (TPS) model. In learning activities, students discuss with their classmates to discuss issues concerning the relationship of landslides with global warming which are presented in the Student Worksheet.

After finishing the discussion, students are asked to present the results of the discussion in front of the class, then the teacher reviews the results of the presentation. At the end of the lesson, students work on the post-test questions. The ability to think critically is measured using a test instrument in the form of 5 essay questions given during pre-test and post-test. The analysis was done descriptively by calculating N-Gain value based on pre-test and post-test score. table 2 is the descriptive analysis based on pre-test and post-test score for critical thinking skills.

Table 2. Results of critical thinking ability test.

Category	Pre-Test	Post-Test
Minimum score	27	73
Maximum score	80	100
Mean	57	88
Std. Deviation	16	10
N-Gain	0.72	

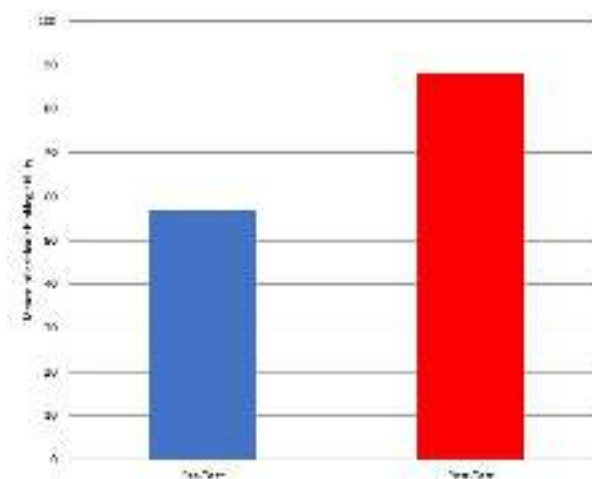


Figure 2. Means of critical thinking ability test.

Table 2 above shows a descriptive analysis and the average value of critical thinking skills is obtained, the average pre-test is 57 and the average the post-test mean was 88 and the N-gain value was 0.72 which, if interpreted in accordance with Table 1, could be included in the high category. Increased critical thinking skills can be seen in figure 2.

Disaster preparedness can be measured using an instrument in the form of a disaster preparedness questionnaire. Similar to the critical thinking skills test, the disaster preparedness questionnaire was also given during the pre-test and post-test.

Table 3. Results of disaster preparedness.

Category	Pre-Test	Post-Test
Minimum score	27	73
Maximum score	93	100
Mean	63	87
Std. Deviation	20	10
N-gain	0.66	

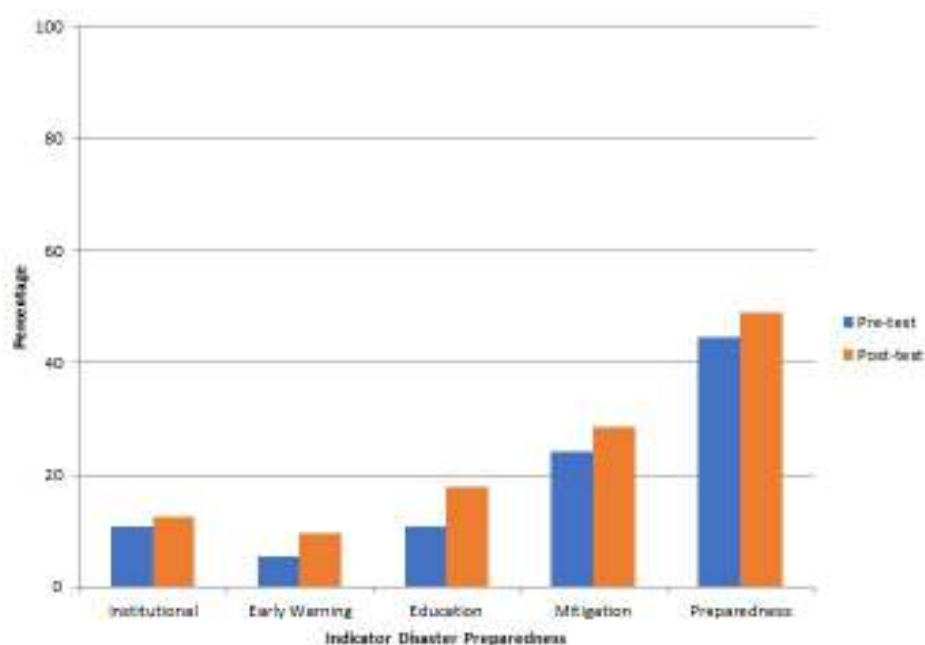


Figure 3. The percentage value of disaster preparedness

Table 3 above shows a descriptive analysis and obtained an average value of disaster preparedness during pre-test and post-test, and a gain of 0.66 which if interpreted in accordance with table 1 can be included in the category is medium. An increase in the value of disaster preparedness can be seen in figure 3, disaster preparedness is measured based on the disaster preparedness questionnaire from each indicator consisting of institutional, early warning, education, mitigation, and preparedness.

3.2. Discussion

Android-based physics learning media integrated landslide disaster education can be applied in learning and leads to improve critical thinking skills and students disaster preparedness. This learning media refers to the 2013 curriculum class XI textbooks which consist of various relevant sources regarding the global warming. The contents of the material on android-based media include introduction to the material on global warming, causes, impacts and efforts to overcome global warming, landslide disaster preparedness and evaluation of learning.

The results of data analysis show that the application of an Android-based physics learning media integrated with landslide disaster education can improve critical thinking skills and disaster

preparedness shown by table 2 and table 3. Critical thinking ability is measured using essay questions that are in accordance with the critical thinking indicators. The ability to think critically has a good increase seen from the value of N-Gain included in the high category. That is because students are very enthusiastic about the Android-based learning media so that they become more active in learning.

Disaster preparedness is measured using a preparedness questionnaire seen from several aspects, they are institutional, early warning, education, mitigation, and preparedness (figure 4). When viewed from the total N-Gain value, disaster preparedness is included in the medium category. The results of pre-test and post-test for disaster preparedness have increased for every aspect. The aspect that has the lowest percentage is early warning and the highest percentage is preparedness. Early warning percentage is 5.3% for pre-test and 9.5% for post-test. The early warning indicator contains posters about landslides, evacuation maps, institutions to be contacted when a disaster occurs, and special procedures or codes in case of a disaster that is understood by school residents. The low percentage of early warning is caused by the absence of components such as posters about disaster preparedness and clear evacuation maps in schools.

This research is in line with the results of research by Lubis et al [15], Mardiana & Kuswanto H [18] Anggraini [19] which explains that the use of android-based learning media can increase learning motivation, make learning more interactive and enjoyable, and improve students' critical thinking skills. Integrated learning in disaster education increases understanding and preparedness in facing disasters [3, 20]. The research result Desfandi et al [4] and Mantasia [21] also showed that integrated learning disaster education can also enhance mitigation efforts and gives overview and reference in the learning process of disaster preparedness.

4. Conclusion

The conclusion in this research is the implementation of an android-based physics learning media integrated with landslide disaster education can improve critical thinking ability and disaster preparedness. For further research, learning about disaster education can be expanded by inserting it into other physical materials that are suitable for landslides.

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