

Disaster Risk Reduction for Natural Disaster using Mobile Learning Application to Improve the Students Disaster Mitigation Literacy in Elementary School

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ABSTRACT

One in every hundreds of deaths in Indonesia is caused by natural disasters. Data from the National Disaster Management Agency (BNPB) shows that during 2020 there were 2,925 disaster events in Indonesia which resulted in 370 deaths, 39 missing and 536 injured. Disasters can certainly take many lives and can happen to children or adults. Moreover, children lack knowledge about disaster mitigation. Therefore, it is very important to foster "Disaster Mitigation Literacy" considering that Indonesia is a disaster-prone area. This research aims to design and develop a mobile application that focuses on increasing literacy and reducing the risk of natural disasters. This mobile application developer uses the ADDIE (Analysis, Design, Develop, and Implement) model. In this application contains about handling disasters both before, during and after disasters. This application offers interesting illustrations so that children can easily learn the material with more fun. This application is expected to provide basic information about natural disaster mitigation for elementary school children. The result of the disaster mitigation literacy improvement application shows that this mobile application affects students understanding of natural disaster preparedness and also helps elementary school children to natural disaster issues and solving problems.

Keywords: Natural Disasters; Mitigation; Mobile Applications; Elementary School Children; Literacy

1. INTRODUCTION

Natural disasters are events that can threaten at any time and cause damage to the environment. Natural disasters can occur in all parts of the world, but the impact will be felt when they occur in a developing country such as Indonesia, where natural disasters occur quite often. Indonesia is a country that is prone to earthquakes, this is because Indonesia is located in the collision zone of three tectonic plates, namely the Eurasian, Indian-Australian and Pacific plates. (Marfai dkk,2008).¹

Since the beginning of 2021, there have been 1,829 natural disasters in Indonesia. Based on data from the National Disaster Management Agency (BNPB) there have been 1,829 natural disasters in Indonesia from January 1 to September 5, 2021. There were 750 floods, 477 extreme weather events, 346 landslides, and 206 times forest and land fires (karhutla). These natural disasters have caused a number of impacts, namely 5,882,843 people were displaced, 510 people died, 70 people were missing and 12,883 people were injured.² Not only experiencing natural disasters, Indonesia is also facing non-natural disasters, namely the spread

of the Covid-19 virus. Previously, Covid-19 was declared a national disaster by the government since April 13, 2020³ and the impact of natural disasters brings great losses to the community.

According to Kousky (2016), disaster mitigation in early childhood is important, because disasters can have an impact on children, such as the impact on physical health, mental impact, and the continuity of their education. The length of time a child can accept a disaster that occurs, and can rise again to live his life is very dependent on the surrounding environment, namely family, community, and the environment in which he lives. Therefore, it is necessary to make efforts to provide knowledge about natural disaster mitigation, especially for children who have limited knowledge and physical when facing disasters.⁴ They need to be instilled in a "Culture of Safety", so that they are aware of the dangers that will be faced and have the knowledge to be able to protect themselves. To teach knowledge about disaster mitigation will be difficult if children are only asked to read materials on natural disaster mitigation. Therefore we need a media that is easy to use by children in learning disaster mitigation.

One alternative media that can be used is a Mobile Application that can be used by elementary school students in learning to use or often called Mobile Learning. Garg & Kadle (2004) stated "Mobile Learning is the acquisition or modification of any knowledge or skill through the use of mobile technology, anywhere, anytime and which results in the modification of behavior"⁵. Mobile learning is a learning model which in its activities uses a smartphone or mobile phone as a medium for distributing information. By using Mobile Learning, children will increase their motivation to learn and the time they need to learn is also more flexible. Therefore, in this study, a mobile-based application was developed that can help elementary school-aged children in gaining knowledge about disaster mitigation. In this application contains about handling disasters both before, during and after disasters. This application offers a story with interesting illustrations so that children can learn the types of disasters and how to prevent them more fun.

2. METHOD

This type of research is Research and Development (research and development) which is a process to develop a new product or improve an existing product, which can be accounted for. The development model used is the ADDIE development model, which is a development model consisting of five stages, namely, Analysis, Design, Development, Implementation, and Evaluation (16). Research on the development of the ADDIE model was carried out only until the Development stage because the purpose of this research was only to develop and produce a valid learning media to be implemented based on the validator's assessment as shown in **Figure 1**.

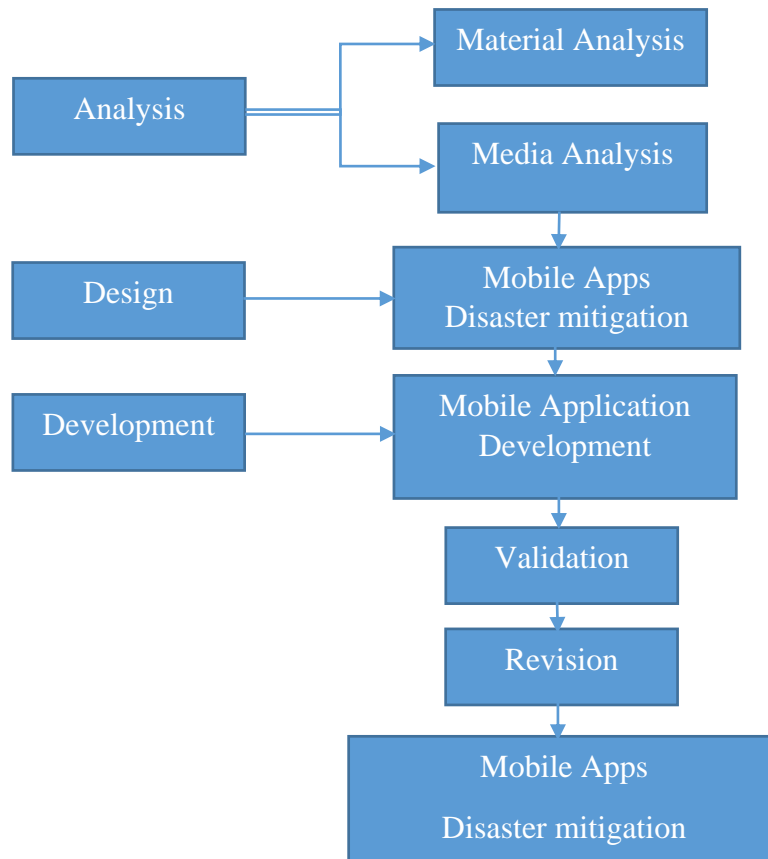


Figure 1. Design Mobile Apps Disaster mitigation

The stages of development research are described as follows:

- a. Analysis, the analysis stage of product development carried out consists of material analysis and learning media analysis. From the analysis it is obtained that the mitigation that has been attempted in Indonesia is still minimal and there is no media that makes it easier for elementary school-aged children to understand about natural disaster mitigation. Mobile Applications can be one of the media that can meet these needs.
- b. Design, at the design stage carried out, among others, namely: 1) designing a mobile application for natural disaster mitigation; 2) Validation sheet for media experts and material experts. Validation of the instrument used in the form of a questionnaire given to material experts and media experts. The black hole teaching media design can be seen in **Figure 2**.

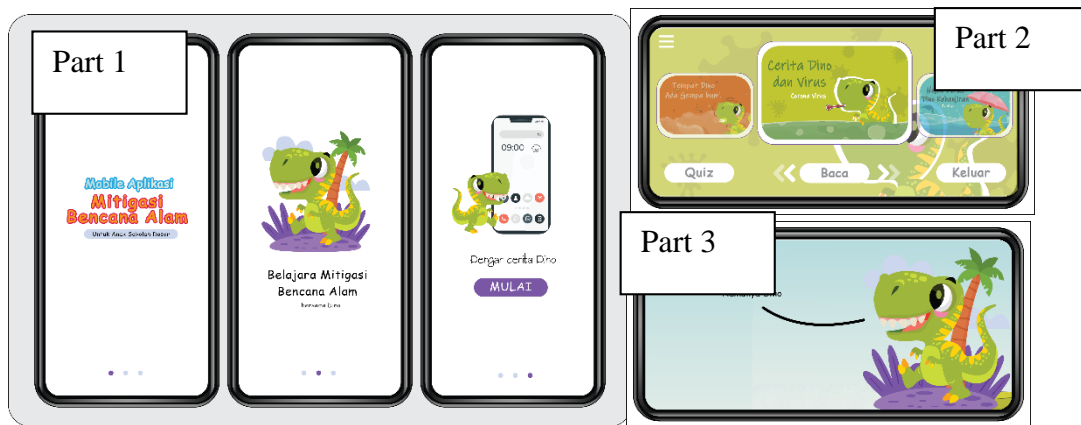


Figure 2. Disaster Mitigation Application Mobile Design

Caption:

1. Part 1 is the initial screen, which is a slap that explains the mobile application, there is a title "Mobile Application for Natural Disaster Mitigation, for children as basic", then instructions about the application with the main character "Dino", and the last slap is the start button for learning.
 2. Part 2 is the main menu of the application, there is a selection of stories about various natural disaster mitigations, such as Earthquakes, Floods and Viruses. There is also a Quiz menu and an exit menu from the app.
 3. Part 3 is an example of a story that will explain one natural disaster mitigation to children, with various interesting illustrations.
- c. Development, the results of the development phase are: 1) Mobile Disaster Mitigation Application; 2) Material and media validation scores.

The validity test of black hole teaching media was carried out by media expert validators and material expert validators. Furthermore, validators are asked to provide general assessment and suggestions on the developed media. The data analysis technique used in this study is descriptive analysis, namely by calculating the percentage value of the validation results as in equation 1.

$$\text{Percentage} = \frac{\text{Score obtained}}{\text{Maximum score}} 100\%$$

The level of feasibility of the product as a result of development research is identified with the score presentation. The greater the score obtained, the product developed, the better the feasibility level. The criteria for decision making in media validation can be seen in **Table 1**.

Table 1. Mobile application eligibility criteria

No	Criteria	Means
1	Very Worthy	80% – 100%
2	Worthy	60% – 79.99%
3	Decent enough	40% – 59.99%
4	less worthy	20% – 39.99%
5	Very Less Worthy	0% – 19,9%

3. RESULTS AND DISCUSSION

The product resulting from this research is a mobile application for natural disaster mitigation. This mobile application was created and designed with the aim of making it easier for elementary school-aged children to learn the types of disasters and how to prevent them by packaging them into a story so that they are easy for children to understand and more interesting. The development of this learning media uses the ADDIE model of learning media design. The ADDIE model has 5 stages including Analysis, Design, Development, Implementation and Evaluation. The research on the development of the ADDIE model was carried out only until the Development stage, because the purpose of this research was only to develop and produce a valid learning media to be implemented based on the validator's assessment.

The validator for the media consists of two experts who work as lecturers in the field of Educational Technology. Based on the results of the validation analysis of media experts regarding the developed teaching media, the percentage is 94.16% as shown in **Table 2**. The aspects assessed include the design of the mobile application display, illustrations in the mobile application and the ease of use of the media.

Table 2. Media Expert Validation Results

No	Aspect	Expert I	Expert II	Average	Total
1	Mobile Application Display Design	95%	90%	92.5%	
2	Illustration In Mobile Application	96%	88%	92%	94.16%
3	Ease of Use of Media	96%	100%	98%	

There are several suggestions from media experts that can be used to improve the media that has been produced. Here's some advice from media experts:

- a. The images presented are adjusted to the material presented
- b. Fix the choice of words and choice of font size should be the same in every story

The validator for the material consists of two experts who work as elementary school teachers. Based on the results of the validation analysis of material experts regarding the natural disaster mitigation mobile application developed, the percentage is 80% as shown in **Table 3**. The aspects assessed include the suitability of the material and evaluation. The suitability aspect of the material consists of the provisions of the content/description of the material, the

scope (breadth/depth) of the material, the factualization of the material, the actualization of the material, the clarity of the included examples to clarify the content, the clarity and suitability of the relevance of the language used, the attractiveness of the material content for elementary school students, compatibility material with purpose and suitability of material with elementary school students. Evaluation aspects Clarity of quiz work instructions, Difficulty level of questions, Conformity of quizzes with the material presented, Conformity of quizzes with learning achievements/objectives and Accuracy of giving feedbacks for use answers.

Table 3. Material Expert Validation Results

No	Aspect	Expert I	Expert II	Average	Total
1	Material Suitability	80%	84%	82%	80%
2	Evaluation	76%	80%	78%	

There are several suggestions from material experts that can be used to improve the media that has been produced. Here are some suggestions from materials experts:

- a. The mobile application should provide comprehensive and in-depth material information.
- b. The language of delivery and teaching in the story is even more communicative.
- c. Pay attention to the level of difficulty of the questions for elementary school age children.

Media experts assess three aspects, namely the design of the display of the mobile application, the illustrations in the mobile application and the ease of use of the media. The media expert assessment diagram can be seen in **Figure 3**. The design aspect of the mobile application display obtained an average value of 92.5%. This shows that the natural disaster mitigation mobile application from the appearance aspect is very feasible to be developed. Based on advice from experts, the images presented are adjusted to the material presented. The illustration aspect in the mobile application gets an average score of 92%. This shows that the mobile application for natural disaster mitigation from the illustration aspect is very feasible to be developed. The aspect of ease of use of media obtained an average score of 98%. This shows that the mobile application for natural disaster mitigation from the aspect of ease of use is very feasible to be developed. Based on the assessment of two media expert validators, the average score obtained is 94.16%. In terms of media, this natural disaster mitigation mobile application is categorized as very feasible to be developed.

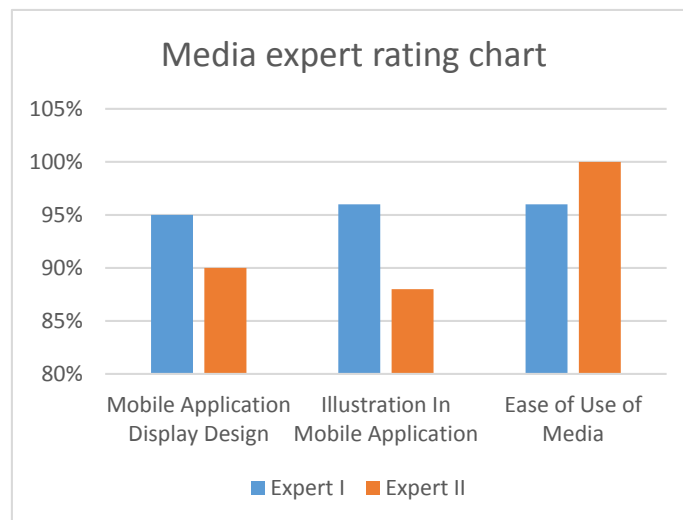


Figure 3. Media expert rating chart

Material experts assess two aspects, namely the suitability of the material and evaluation. The material expert assessment diagram can be seen in **Figure 4**. The material suitability aspect obtained an average score of 82%. This shows that natural disaster mitigation mobile applications from the aspect of material suitability are very feasible to be developed. Suggestions from material experts, the mobile application should provide comprehensive and in-depth material information and the language of delivery and teaching in stories is more communicative. The aspect of evaluating the mobile application on the material obtained an average score of 78%. This shows that the mobile application for natural disaster mitigation from the aspect of evaluating the material is feasible to be developed. Based on the assessments of the two validators for the material, the average value obtained is 80.3%. In terms of material, this black hole teaching media is categorized as feasible to be developed.

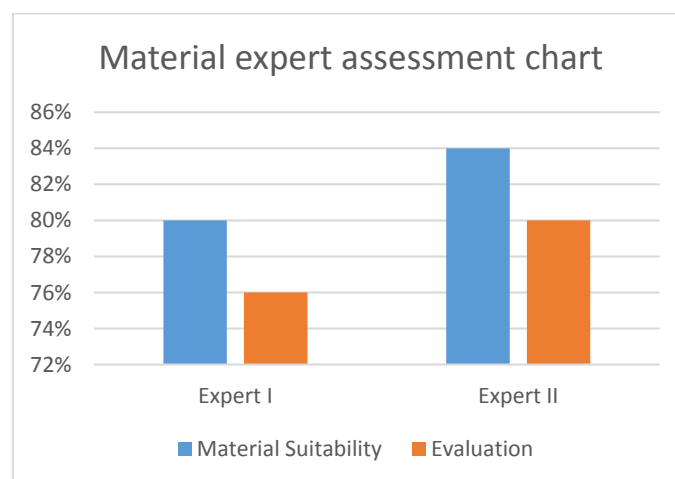


Figure 4. Material expert assessment chart

The average validation from media experts and material experts was obtained at 87.8% with a very feasible category. From these results, it can be concluded that the mobile application for natural disaster mitigation is very feasible to use. By making improvements to several aspects can make this media even better. With the mobile application for natural

disaster mitigation, elementary school students will be able to learn about various kinds of disaster mitigation. The use of mobile applications in the learning process has several benefits such as providing a pleasant atmosphere in learning, providing variety in learning, presenting events events that are difficult to get into everyday life, overcome the limitations of space, time and senses, and make abstract concepts real. This research is only limited to expert judgment and has not been rated by users. The next research that can be done is to test the media to users and also develop it in its follow-up form.

4. CONCLUSION

Based on the assessment of the two validators for media, the average value obtained is 92.5%. Mobile media for natural disaster mitigation applications in terms of media is categorized as very feasible to be developed. Based on the assessments of the two validators for the material, the average score obtained is 82%. Mobile media for natural disaster mitigation applications in terms of material is categorized as very feasible to be developed. The average validation from media experts and material experts was obtained at 87.8% with a very feasible category. By making improvements to several aspects can make this media even better.

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