Development of Interactive Multimedia for Earthquake Disaster Preparedness in Elementary School

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Abstract This research study aimed at produce interactive multimedia as a learning medium for earthquake disaster mitigation in the face of earthquake disaster in a more interesting and fun way. The development process was examined according to the Analysis, Design, Develop, Implement, Evaluate (ADDIE). This produce interactive multimedia has a video about the simulation of earthquake and earthquake mitigation video of 3 stages that is before, during and after earthquake. In expected can be providing basic safety information and improve preparedness against earthquake disasters for elementary school student.

1. Introduction
Indonesia which is one of the archipelagic countries included in earthquake disaster-prone areas. This is because it’s located within the collision zone of three tectonic plates, namely Eurasia, India-Australia and the Pacific plate. [1] The Indo-Australian Plate moves north and infiltrates the Eurasian plate, while the Pacific plate moves relative to the west. So that it resulted in Indonesia being in the ring track or known as the Ring of fire.

In the framework of disaster preparedness, awareness of all parties is required in order to minimize the losses caused by the devastating earthquake. The importance of public awareness in increasing understanding of and resistance to earthquake disaster must be inculcated to the community, especially children who have yet to understand about what they should do when the unexpected happens. [2] In the event of a disaster, children will be more vulnerable because of their lack of knowledge regarding the safety mitigate yourself for shelter during the devastating earthquake. [3]

As a country to earthquake disasters-prone, the Indonesian Government still has major problems, namely low disaster management performance, lack of attention to disaster mitigation, and still weak on the role of the school in the recognition of education Disaster [4]. The education of earthquake disaster in schools is important considering that Indonesia is vulnerable to earthquake disasters in particular. The education of earthquake disaster in elementary school still faces many problems and challenges. [5]

Building a culture of safety and resilience specifically for children and the younger generation, Disaster Preparedness Education needs to be developed at the level of basic education. Planting earthquake disaster mitigation education for children from elementary school is the right of the child to participate in disaster risk reduction and also had a meaningful contribution. [6] The step that can be taken is to provide training at special education institutions in schools. Mitigation knowledge must be given to students in schools with teacher direction or mitigation learning instructions for help ourselves.
of earthquakes. This mitigation learning should all children learn together regardless of the difficulties or differences that might exist in them.

Based on the results of the observation, earthquake mitigation education is not included in elementary school studies in Indonesia, especially elementary schools in Wonogiri district. In the curriculum 2013 elementary school there are only material of flood disaster, drought and landslide. Whereas in Indonesia a lot of disasters happen and resulted in the sacrifice of thousands of inhabitants and treasures at least especially when the earthquake is devastating. If applied, disaster management education needs to learn the right media to help students learn so that students can save themselves successfully without the help of others.

Media as a component of learning resources or physical rides containing instructional material and can stimulate students to study. In the educational world, the development of learning media can be done with the help of computer technology. Learning Media can be used to transmit messages from the sender to the recipient of the message, so that it can stimulate the feelings, attention, interests, and minds of learners in following the learning activities [7-8].

This research aims to build interactive multimedia as an instructional media for disaster mitigation of earthquake and the fundamentals of safety in the face of the devastating earthquake which is more interesting and fun. The target of this media is elementary school students. This research develops 3 stages in improving preparedness in the earthquake disaster namely the stage before the earthquake, when the earthquake and after the earthquake occurred.

1.1. Development ADDIE Model
ADDIE is an acronym for Analyze, Design, Develop, Implement, and Evaluate. ADDIE is a product development concept. The ADDIE concept is being applied here for constructing performance-based episodes designated for learning space. Learning space is the term used to refer to intentional learning environments rather than intentional learning that occurs all the time. Intentional learning environments are complex and ADDIE provides a way to navigate the complexities associated with developing modules for use within intentional learning environments. The application of ADDIE to instructional systems design facilitates the complexities of intentional learning environments by responding to multiple situations, interactions within context, and interactions between contexts. Yet, the fundamental ADDIE components remain the same throughout various applications and variations of the ADDIE paradigm depend on the context in which ADDIE is being applied.

This star This strategies that move away from didactic, limiting, passive, singular modes of design, and instead move toward designs that facilitate active, multi-functional, situated, inspirational approaches to learning The goals of first present the ADDIE concept (Fig. 1) [9]. The phases of this model include analysis, design, development, implementation, and evaluation. [10]
2. Methods
This research is the implementation of the development of media education as a means of learning and educational development that aims to improve preparedness for children. Target media usage this is a student in elementary school. Method development for the use of research is ADDIE model. The process of the development of interactive multimedia as follows [11-12]:

2.1. Analysis
On the development of this stage is to find out information about the learning process that takes place in schools and determine the needs of the media that will be needed in the next design phase.

2.2. Design
At this stage starts by creating a prototype design for interactive multimedia to be created. Collecting content contained in media such as materials, images and video. Build grooves using storyboards and flowcharts.

Storyboards are used to design in General include the design template, the layout of menus, navigation buttons and the material will be presented. While the flowchart is created to provide a thorough overview of the plan design of multimedia will be made in the chart with particular symbols that describe the sequence of the process in detail.

2.3. Development
At this stage to discuss the process of creating and building a media from the draft that was made earlier. The concept of interactive multimedia which is created using adobe flash professional software cs6. Adobe flash professional cs6 is computer software which is the flagship product of adobe systems. Adobe Flash is used to create vector images or animated images.

This stage also conducted expert validation Test against the use of media, data obtained using questionnaire given to experts. The experts are the experts/media and educational practitioners. The data obtained collected is then processed into quantitative data next to search data average. Interactive multimedia assessment aspects include: 1) Assessment of the feasibility of language aspects; 2) Evaluation of the feasibility aspect of presentation; 3) Assessment of aspects of media effects on learning strategies; 4) Evaluation of the feasibility of a comprehensive display.

2.4. Implementation
The media are implemented in the learning process. The goal is to look at the effectiveness of the use of media in learning. At this stage the learning system is ready for use by learners. Activities performed in this stage are to prepare and to market it to the target learners. 1) Preparing teachers: As developer in implementing partners in the implementation of interactive multimedia; 2) prepares students: Provide direction on students before doing the implementation.

2.5. Evaluation
This stage is the stage of evaluating the research that has been carried out. At this stage, researchers will compare the two group’s posttest to know the level of effectiveness of a product that has been developed by researchers. Stages of evaluation in the development model ADDIE generally consists of three general procedures, i.e.: Evaluation Criteria, Select a tool for evaluation, Conduct evaluation itself.

3. Results and Discussion
3.1. Media Specifications
This medium is an interactive multimedia about earthquake disaster mitigation. The interactive Multimedia mitigation of this earthquake disaster presents the media accompanied by video and images. The material provided includes earthquake definition, earthquake causes, earthquake mitigation understanding and earthquake disaster mitigation phase. Phase mitigation is the main material in
interactive Multimedia consisting of 3 stages, namely: Before the earthquake, during the earthquake and after the earthquake.

3.2. Implementation of Interface
In the first stage the use of media, the user enters the software compac disc or flash disc storage media on laptop or computer. Wait until the splash page to start and run, can be seen in the following figure.

![Figure. 2 Loading Media](image1)

![Figure. 3 Front Page of “START”](image2)

This opening page will appear at the time the media first opened. After clicking the "Start" button, it will be entered on the first page of the User Guide page (Fig.4) and several page menu on the media interface.

![Figure. 4 Page Setup Instructions](image3)

![Figure. 5 Panel Introductory Material](image4)

The next page can directly click on the Media Interface button panel. If the user clicks on the introductory page, the view will be the introductory material, which is an earthquake, the cause of the earthquake (Earth layer) and understanding of earthquake hazard mitigation. Before students study the mitigation, students with this introductory material (Fig.5) can learn about what an earthquake is, how the causes of earthquakes and what is disaster mitigation.

The user can click on each panel material, he can learn the introductory material in each panel with ease. (Fig.5) and the material will open as the following figure 6.

![Figure. 6 Contents Of The Introductory Material](image5)
After studying introductory material, students can directly click on the panel interface the core material. In this core material there are 3 stages that contained material before, during and after the earthquake occurred. Students can begin learning by clicking on the image on each page to see the video in accordance with material that is opened, the display of material before the earthquake that contains an overview of how to prepare before an earthquake occurs, It can be seen as Figure 7.

![Figure 7 Mitigation Material Before An Earthquake](image)

Display of mitigation materials during an earthquake disaster that contains an overview of how to save yourself during an earthquake and images can be click to display the video, can be seen in Figure 8.

![Figure 8 Mitigation material during an earthquake](image)

Display of the mitigation material after an earthquake that contains an overview of how to save yourself after an earthquake occurred and the image can be click to display the video, can be seen in Figure 9.

![Figure 9 Mitigation material after an earthquake](image)

Learning to use interactive multimedia make students remember easily and fun learning in the classroom. Material that features images with animated moves, brief explanation accompanied music
aims to let eager students in the learning process and not feel bored. This interactive Multimedia can help students in their initial rescue efforts, so students can easily remember and understand lessons on earthquake disasters and disaster mitigation in a more compelling and enjoyable manner.

3.3. Media Usability Testing

*Media Usability Testing* Stages of validation or testing the media treated qualitatively and quantitatively. It is qualitative as a questionnaire for teachers and students about multimedia products. It is quantitatively the material expert assessment sheet, media expert, and student value calculation. At this stage, before conducting the trial, the initial test (design validation) was carried out through material experts and media experts. The point is to ensure that the multimedia materials and display are appropriate and worth using.

This calculation uses the likert scale with scale 1-4. The result of the calculation process is presented in the table to obtain the eligibility test score media. The interval is determined by using the equation with a maximum score of 4 and score a minimum of 1. Then by equation (3.2) found the interval class (i) 0.75. Minimum scale is set to 1.00. Then the resulting categories can be seen in Table-1.

| Table 1 Categories Interval |
|-----------------------------|
| Interval | Categories |
|-----------|------------|
| 3,28 – 4,03 | Excellent (E) |
| 2,52 – 3,27 | Good (G) |
| 1,76 – 2,51 | Poorly (P) |
| 1,00 – 1,75 | Bad (B) |

The likert scale was analyzed by calculating the score of each interval from the statement given to the respondent. The following is the result of the assessment of the test against the user with each variable.

3.3.1. Validation of Materials Experts

Materials expert in the development of this medium, Professor of Geography Education UNS Courses disaster mitigation. Expert assessment of the data material to quality learning developed media do with 4 aspects, namely the feasibility aspect of the content of the 5 items, aspects of the feasibility of serving of 5 items, aspects of the effects of media on learning 4 items and aspects of the valuation constekstual 6 items.

Based on the results of a material expert validation calculation can be concluded that the content of the material presented in the interactive Multimedia developer results per criterion is 45% expressed very well and 42% expressed well, with an average score of 3.45 or 87% and If converted on scale 4 belongs to the category "Excellent".

| Table 2 Distribution of material expert assessment |
|---------------------------------|
| Categories | Scale | Frequency | Total | Percentage (%) |
|-------------------------------|-------|-----------|-------|----------------|
| Excellent (E)                | 4     | 9         | 36    | 45             |
| Good (G)                      | 3     | 11        | 33    | 42             |
| Poorly (P)                    | 2     | -         | -     | -              |
| Bad (B)                       | 1     | -         | -     | -              |
| Total                         | -     | 20        | 69    | 87             |
| Mean                          | 3.45  |           |       |                |

3.3.2. Validation of Media Experts

The media experts in multimedia development of this learning are a Geography lecturer with learning media skills. For the validation of this media contains 4 aspects of the language aspect 4 items, the
presentation aspect 2 items, the aspect of the media effect on the learning Strategy 4 items and a thorough view aspect 8 items with a total of 18 questions.

Based on the results of the validation of the media experts can be concluded that the display aspect presented in the interactive Multimedia development results 56% expressed very well, 29% expressed well and 3% expressed adequately, with an average score of 3.50 or 88% and if converted on scale 4 belongs to the category "Excellent".

| Categories  | Scale | Frequency | Total | Percentage (%) |
|-------------|-------|-----------|-------|----------------|
| Excellent (E) | 4     | 10        | 40    | 56             |
| Good (G) | 3     | 7         | 21    | 29             |
| Poorly (P) | 2     | 1         | 2     | 3              |
| Bad (B) | 1     | -         | -     | -              |
| Total | -     | 18        | 63    | 88             |
| Mean | | | 3,50 | |

Based on the validation results of material experts and media experts belonging to the category are excellent for the operation of the application, both content and appearance. Experts’ opinions during the use of the interactive Multimedia application are very positive. They demonstrate the belief that this media can motivate strong and enthusiastic students to learn with fun. Because the media is easy to use and friendly, so it is expected that it can increase user interest to learn.

4. Conclusion

In the educational world, the development of learning media can be done with the help of computer technology. Based on the validation results of material experts and media experts belonging to the category “Excellent” with material expert assessment of 3.45 with a percentage of 87% and with media expert assessment value 3.50 with a percentage of 88%. This multimedia interaktif earthquake disaster mitigation consists of 3 main stages in the self-rescue, namely before, during, and after the earthquake occurred.

This media is the right choice for students in mitigation learning. As a whole, the application of learning media is effective in helping students in earthquake preparedness. In the future we want to develop this media more interactive and accessible to the public.

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