Development of Natural Disaster Mitigation Teaching Materials to Improve Understanding of Disasters

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Abstract. This study has three objectives (1) Developing natural disaster mitigation teaching materials; (2) knowing student learning outcomes when using instructional materials that have been developed (3) Knowing student responses to instructional materials that have been developed. The research method used is Research and Development (R & D). This research was conducted at high school (SMAN) 3 Pariaman to retrieve needs data, test products, and experimental teaching materials. The class sampling technique uses a cluster random sampling technique. The data collection technique is through questionnaires and tests. The results of this study are to produce products in the form of natural disaster mitigation teaching materials according to the needs of students and teachers and have been validated by experts and tested. The experimental results of natural disaster mitigation teaching materials indicate that teaching materials are used effectively in learning. The results of this study are validations consisting of 4.1 instructional review values and 4.0 technical review values, so the results of developed product validation are valid. Based on the analysis of learning outcomes, 72% of students have high category values. This study concluded that the development of teaching materials is valid and can be used as teaching material.

1. Introduction

Indonesia has experienced thousands of earthquakes and hundreds of tsunamis in the last four hundred years (Aydan, 2008). Some of the earthquake lanes are in the sea so that it is very potential to cause a tsunami (Arief Mustofa Nur, 2010). Disaster events cause many casualties. The number of victims in natural disasters can show that the local community still knows little about natural disasters. One of the actions that can be taken to reduce the number of fatalities is to provide knowledge about disaster mitigation and disaster preparedness (Ayriza, 2009). Disaster mitigation is an effort made to prevent or reduce the impact of disasters (Cecep, Permana, Nasution, & Gunawijaya, 2011). Davidson & Shah, (2013) suggests that it is necessary to share shared roles and responsibilities in improving preparedness at all levels, both children, adolescents, and adults. One way to convey about disaster mitigation is through learning in education.

Education is a tool to increase the ability of communities in disaster risk reduction. Learning about disaster mitigation must be given to all levels of society, including at school. The formation of a disaster preparedness culture can be carried out systematically through education. As stated in Law No. 24 of 2007 concerning disaster management, disasters must be included in development programs including in the education sector. It is also emphasized in the law that education is one of the determining factors in disaster risk reduction activities.

Disaster education activities in schools are very effective, dynamic and sustainable in an effort to disseminate education and disaster knowledge. The provision of disaster education in schools is very good because information and knowledge about disasters provided can be transmitted and delivered by the school community to the closest community. After an interview with the geography teacher at high school (SMAN) 3 Pariaman, the teaching materials needed by teachers and students were not fulfilled. Teaching materials for teachers are guidelines for all activities in learning. For students, teaching materials are used to study the competency material to be achieved.

Development of teaching materials tailored to the needs of students in learning. Sitepu (2012) stated that in developing teaching material materials need to pay attention to 3 aspects, namely: 1) Learning objectives set in the curriculum; 2) The truth, update, and accuracy of information submitted
based on the relevant disciplines and; 3) Language used in accordance with the language skills of students. Geography teaching materials used by students have deficiencies in their presentation. One of the indicators is the neglect of some writing rules. The writing rules in question include language truth, substance, and image presentation. (Adlika, Karyanto, & Yusup, 2017) describes the imaging of high school geography textbooks, concluding that the composition of high school geography textbooks is dominated by facts/data, a small number of concepts, and a bit of generalization, so that learning activities of students only memorize and understand concepts in textbooks.

Development of teaching materials is one form of learning process activities to improve or improve the quality of learning that takes place (Trisnaningsih, 2007: 3). Development of material for disaster mitigation teaching materials is very necessary. In the world of education teaching materials is a vital aspect of the effectiveness of learning. Teaching materials have important functions in learning. Hernawan, et al. (2008) explained the function of teaching materials as a guideline for students who will direct all their activities in the learning process as well as the substance of competence that must be mastered or learned.

Based on the above problems, the research objectives are 1) Disaster mitigation teaching materials that have been developed are included in the valid category in instructional studies and technical studies and teaching materials developed can be used in development tests without revision, 2) Student learning outcomes obtained in the study included in the high category, 3) Student responses to disaster mitigation teaching materials that have been developed are included in the positive response category.

2. Research Method

This study uses the Research and Development (R&D) research strategy. Sugiyono (2009) argues that research and development methods are research methods used to produce certain products, and test the effectiveness of these products. In the field of education, the products produced through R & D research are expected to increase the productivity of education, namely graduates who are numerous, qualified and relevant.

The procedure carried out in this study follows the Research & Development (R&D) design stages of Borg & Gall (1989) which are limited to the 6th stage. The following are explained in each step as follows:

2.1 Preliminary studies

Preliminary studies conducted consisted of literature studies and field studies. The literature study deals with the results of relevant research regarding the development of teaching materials. As well as identifying existing teaching materials that have been used so far by students, especially in Core Competencies and Basic Competencies related to the concept of natural disaster mitigation in class XI SMA / MA Geography textbooks.

2.2 Planning

The planning phase includes the preparation of research instruments, including the preparation of multiple-choice test questions, questionnaires responses of experts to find out the readability test of teaching materials and compile questionnaires for student and teacher responses. Furthermore, judgments are carried out on the expert lecturers. M arouses an early draft of the teaching materials will be developed, which previously made Macros Structure and Concept Maps.

2.3 Development

This stage is the stage of developing teaching materials from the initial draft which has been made into disaster mitigation teaching material. Teaching materials are made according to the macrostructure or concept map, which is integrated with the local wisdom of the community.

2.4 Validation

Validation of teaching materials is done by asking for judgment from experts consisting of material experts and experts to assess the feasibility of teaching materials by users, namely in this case the Geography teacher.

2.5 Revision

The initial revision is done after getting input from the validator. Both in terms of material and graphics of the material itself. Also input and users of teaching materials, namely Geography teacher.
2.6 Trial

Furthermore, the revised teaching materials were tested on a limited scale conducted at one school. No special learning design or learning methods are carried out, then revisions to teaching materials are carried out based on the results of limited trials.

3. Results and Discussions

This research is a study that aims to produce teaching materials disaster mitigation. Teaching materials developed have advantages such as the presentation of more interesting material, improvement in the rules of good and correct language and presentation of images. Teaching materials developed are divided into three learning activities where each learning activity has practice questions, evaluation questions, and self-assessment instructions.

After disaster mitigation materials are developed in draft form, the next stage is the product in logic validation. The following are the results of quantitative data on instructional and technical studies on the development of disaster mitigation teaching materials in table 3.1

| No. | Aspect           | Val | Category |
|-----|------------------|-----|----------|
| 1   | Instructional Study | 4.1 | Valid    |
| 2   | Technical Review  | 4.0 | Valid    |

Based on the results of the instructional and technical study validation in table 3, then disaster mitigation teaching materials are said to be valid, this is in accordance with the interval category of validity from range $4 = V_a < 5$ which is included in the valid category (Hobri, 2010: 52).

As for the results of qualitative data validation, the instructional study went through two validation processes because at the first validation stage the product needed to be revised and the validation of both products could be used without revision. The following results of qualitative data in instructional studies can be seen in tables 3.2 and 3.3.

| Validator | Suggestions and comments | General assessment |
|-----------|--------------------------|--------------------|
| 1         | Improving the writing of teaching materials | Used with revisions |
| 2         | Improve the presentation of grammar | Used with revisions |
| 3         | Fix concept maps         | Used with revisions |
| 4         | Improve the presentation of images on teaching materials | Used with revisions |

| Validator | Suggestions and comments | General assessment |
|-----------|--------------------------|--------------------|
| 1         | Continue in the research phase | Can be used without revision |
| 2         | Continue in the           | Can be used        |

Table 3.1 Expert validation results

Table 3.2 Results of qualitative data

Table 3.3 Instructional studies
Teaching materials developed after being said to be valid both through study instructional and engineering stages then the material developed can be used at the validation stage empiric (development test).

Data that obtained from the results of development tests regarding learning outcomes already accumulated from three domains that is equal to 85 and the value is above average, while if displayed in the form of a percentage it is obtained the value of student learning outcomes in the category high learning outcomes according to the criteria level set by Hobri (2010: 58). This matter can be seen in table 3.4.

| total Student | Percentage | Result category |
|---------------|------------|-----------------|
| 0             | 0%         | Very low        |
| 0             | 0%         | Low             |
| 5             | 14%        | Is being        |
| 26            | 72%        | High            |
| 4             | 14%        | Very high       |

Disaster mitigation teaching materials develop have an influence on student learning outcomes. Student learning outcomes are included in the high category because of the advantages of teaching materials developed, namely teaching materials presented with communicative language so that students easily understand the material in teaching materials, besides teaching materials, are also accompanied by various colorful and interesting images that can make students interested in learning. Students' interest makes students happy and active in learning, this is evidenced by the high effective value of students and students always complete the practice questions contained in teaching materials. Teaching materials presented must also be able to attract students so students are interested and happy to learn. If students feel happy and interested, then this may impact how learning materials obtained by students (Trian et al, 2013; Tyasning, DM et al, 2012)

The last aspect measured in the development test is about students' responses regarding the assessment and responses to the disaster mitigation teaching materials developed. There are 4 aspects that are responded by students, namely about feeling happy, understanding, understanding and interested in disaster mitigation teaching materials. This response assessment criterion uses the format from Hobri (2010). The following are the results assessment of student responses to instructional materials developed can be seen in table 3.5.
Based on the results of the response assessment, all aspects are said to be in the positive response category according to Hobri reference (2010: 31) because the value of more than 50% of students gives a positive response.

4. Conclusions and Recommendations
1) Disaster mitigation teaching materials that have been developed are included invalid categories in instructional studies and technical studies and teaching materials developed can be used in development tests without revisions, 2) Student learning outcomes obtained in the study are included in the high category, 3) Student responses the disaster mitigation teaching materials that have been developed are included in the category of positive response. Based on the results of research on Developing teaching materials on disaster mitigation, there are several suggestions, among others: 1) Management of the time at the time of the study should be considered properly, 2) it needs continued research on the development of teaching materials related to disaster mitigation, 3) appropriate learning methods, 4) and good classroom management by teachers.

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