Development of a regional based disaster learning model at senior high school

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A B S T R A K

Kejadian Gempabumi, tsunami dan likuifaksi pada tanggal 28 september 2018 menimbulkan korban jiwa yang sangat besar. Penelitian ini menggunakan pengembangan model pembelajaran kebencanaan dengan unsur kewilayahan sebagai dasar materi kebencanaan pada tiap wilayah. Jenis penelitian ini pengembangan R&D mengikuti pengembangan ADDIE 5 tahap yaitu *analisys, design, develop, Implementation, dan Evaluation*. Subjek penelitian adalah siswa dan guru kelas XI Sekolah Menengah Atas di Kabupaten Sigi. Teknik dan instrumen pengumpulan data dilakukan melalui tes dan non tes yang meliputi wawancara, observasi, kuisioner, instrument validasi, dan soal tes pengetahuan. Teknik analisis data deskriptif kualitatif dan statistik deskriptif. Adapun hasil penelitian menunjukkan Kelayakan produk yang telah divalidasi ahli berada pada kualifikasi layak yaitu 80%. Produk perangkat pembelajaran dinyatakan sangat praktis oleh guru 89,93% dan praktis oleh siswa yaitu 77,97% untuk pembelajran SETS dan 75,50% untuk kepraktisan modul mitigasi dan adaptasi bencana. Hasil uji keefektifan dinyatakan efektif pada kategori sedang dengan perolehan skor 0,40.

Keywords:
Learning
Disaster Mitigasion
Regional

A B S T R A C T

The earthquake, tsunami and liquefaction incident on 28 September 2018 caused huge casualties. This research is a type of R&D research by following the ADDIE development up to stage 5, analysis, design, develop, implementation, and evaluation. The population were students and teachers in class XI Senior High School in Sigi Regency. Data collection techniques and instruments were carried out through tests and non-tests which included interviews, observations, questionnaires, validation instruments, knowledge test questions. The results of study indicate the feasibility of products that have been validated by experts is at a decent qualification, namely 80%. The learning equipment products were stated to be very practical by the teacher, 89.93% and practical by the students, namely 77.97% for the SETS learning and 75.50% for the practicality of the disaster mitigation and adaptation modules. The results of the effectiveness test were declared effective in the medium category with a score of 0.40.

Introduction

The geological and morphological conditions of Central Sulawesi make this province prone to disasters, so it is necessary to increase public knowledge regarding disasters. Community preparedness in facing disasters is very important because in a disaster there is an element of uncertainty so that people need information to find out what happened, break down uncertainty and make decisions to survive (Allen, 2006; Paton, 2013; Paton & Johnston, 2001; Perry & Lindell, 2003; Tuohy, Stephens, & Johnston, 2014) People are not prepared to face the threat of disasters, among others, because many people who do not know the vulnerability of their area to disasters and there have not been many efforts to improve disaster preparedness due to limited resources (Ashida, Robinson, Gay, & Ramirez, 2016; Boon & Pagliano, 2015; Ndah & Odihi, 2017).

The earthquake, tsunami and liquefaction incident on September 28, 2018 caused huge casualties. Not only material losses but also

casualties, where the biggest victims came from school-age children (Socquet, Hollingsworth, Pathier, & Bouchon, 2019). Based on literary studies, it shows that earthquakes with a magnitude of more than 6.0 have a repetitive cycle (Omira et al., 2019; Rusydi, Efendi, Sandra, & Rahmawati, 2018). Therefore, to reduce the risk of earthquakes in the future, it is necessary to increase public knowledge regarding disasters. This disaster education must be instilled from an early age so that the loss of life, especially among vulnerable groups, can be suppressed (Astill, 2018; Unesco, 2010).

Based on interviews with several Sigi communities that their knowledge and readiness about disasters is still very minimal, they don't even know the threat of disasters around them, besides that the disaster curriculum has not been much integrated in schools. Rusilowati said that to provide public understanding of disaster can be done through integrated learning in several subjects (Rusilowati, Supriyadi, & Widiyatmoko, 2015). Through disaster education, people living in disaster-prone areas have knowledge, attitudes, and skills regarding disaster preparedness and emergency response (Widodo & Hastuti, 2019).

The results of preliminary observations in the field show that Geography teachers in several high schools in Sigi Regency, in teaching geography subjects, they are still limited to general knowledge, where the teacher's learning process is limited to the use of existing learning media available at school, such as textbooks and student worksheets. Another problem is the teacher's lack of interest in developing a curriculum in accordance with the regional potential in their area, and teachers have never provided disaster material that is integrated with the potential for disasters in their region through a regional approach. The learning model is a pattern that is used as a guide to planning classroom learning or learning in a tutorial setting and to determine learning tools including books, films, computers, curricula and others (Heer, 2012; Mizunami & Matsumoto, 2017). Therefore, in this research, a disaster learning model will be developed by incorporating regional elements as the basis for disaster material. The territorial element becomes very important because each disaster will have a different impact and handling for each region (Villegas-González, Ramos-Cañón, González-Méndez, González-Salazar, & De Plaza-Solórzano, 2017). This research is a renewable research with the hope that the results of the research will have a significant impact on increasing public knowledge, especially students.

Method

Research on the development of the 4D model (Four D Models), includes 4 stages, namely the stage of defining, designing, developing and disseminating (Richey & Klein, 2014; Schuhmacher, Gassmann, & Hinder, 2016), but in this research it only reaches the stage three, namely product development and testing in small groups in the experimental class.

The data analysis technique used in the development of this learning model is descriptive qualitative analysis and descriptive statistics. The results of the analysis are used to revise and describe the product development. Learning devices are declared valid to be used to obtain the criteria of "quite feasible" and / or "very feasible", based on the interpretation and decision making about the quality of development products using the following validity criteria:

Table 1. Conversion of Achievement and Qualification Levels

Achievemen	qualification	Test decision
81 – 100	Very worthy	No need for revision
61 – 80	Well worth it	No need for revision
41 – 60	Decent enough	Revised
21 – 40	Noth worth it	Revised
0 – 20	Very less feasible	Revised

Product Effectiveness Test

The product effectiveness test was carried out by looking at the differences in student achievement scores on KD disaster mitigation before being given treatment and after being given treatment. The effectiveness test activity was

carried out using the pretest-posttest design (pretest-posttest design) in a single group used manual calculations, namely the N-Gain effectiveness formula as follows (Artiningsih & Nurohman, 2020; Munifah et al., 2019; Wulandari, Dasna, & Wonorahardjo, 2019):

N-Gain = post test score – the maximum pretest score – pretest score Index criteria g: Score (g) ≥ 0.70 high category, Score 0.30 ≤ (g) ≥ 0.70 category Medium, & Score (g)> 0.30 category Low.

Results and discussion

Based on the analysis at the stage of product development and revision of the validation results by the validator, it has resulted in product development draft II. Draft II is a development product that has been improved based on input and suggestions from the validators. Then it was tried out in class XI MIPA 3 SMA Negeri 6 Sigi, field trials were carried out 3 times in accordance with the learning implementation plan that had been developed. This trial was conducted by the teacher as the next step, namely the implementation stage of product development. The implementation of trials in the experimental class involves a geography subject teacher to carry out the learning process and one other teacher to observe the activities of the learning process in the classroom by applying a regionally based disaster learning model. The implementation of the implementation of development products is to see the real use of development products and to see interactions

between students and to ask students for feedback on products that have been developed based on the results of practical assessment of learning models that have been developed and through the effectiveness of using regional-based disaster learning model development products.

Practicality of Territorial Based Disaster Learning Model Assessment of the practicality of developing an area-based disaster learning model is carried out in every aspect of the implementation of learning activities that are categorized as good. Some of the activities carried out in the learning process are (1) conveying learning objectives; (2) train students' abilities in constructing concepts, analyzing the potential and characteristics of natural disasters in the area where students live, and learning materials are delivered based on facts and phenomena of natural disasters in the area where students live; (3) learning process activities centered on student activities where the teacher acts as a facilitator, so that students play an active role in constructing concepts and discovering the phenomena around them.

This shows that the learning model developed can be used. The following shows the results of the analysis of the practicality of the regionally based disaster learning model obtained using a questionnaire on the responses of teachers and students to the practicality of development products. The practicality assessment is measured based on the results of the implementation of the lesson plan and the responses of students in the field test (Table 2).

Table 2. The average score of product development practices by the teacher

Observed aspects	Results				
	∑ P1	∑ P2	∑ P3	∑	Category
Clarity of instructions for using RPP	88%	81%	81%	83%	Very worthy
Achievement of competencies and learning objectives	88%	88%	88%	88%	Very worthy
Student response	75%	83%	83%	80%	Worthy
Difficulty level in implementing	67%	75%	83%	75%	Worthy
Adequacy of time	75%	75%	75%	75%	Worthy
Total average score of all meetings			**80%**		**Worthy**

Based on the results of the analysis of the score data acquisition average score of learning implementation with a regionally based disaster learning model, it can be concluded that the product development is practical and feasible to use. The percentage of the average value of the practicality of the learning model at three meetings by the geography subject teacher was 80%. This means that the learning model developed has met the level of practicality. The practicality of product development was obtained by using a questionnaire on the teacher's response to the implementation of the learning model which was carried out at 3 meetings.

Based on the results of observations in the learning process using area-based disaster mitigation and adaptation modules and student worksheets (LKPD) which are integrated with disasters in the area where students live, that students can follow the learning well. Thus it can be concluded that the modules and LKPD used in learning really help students in the learning process and can motivate learning, so that the learning process is interesting and can be followed by all students.

The practicality of the learning tools was also obtained by using a questionnaire on the responses of students to the practicality of the learning model and the percentage of the average value of the practicality of the module and LKPD of 20 students in class XI MIPA 3 SMA Negeri 6 Sigi. The score for the practicality of development products is 73%, where the learning model development is 70%, the module is 78% and for LKPD it is 72%. A recapitulation of the results of student questionnaires regarding the practicality of learning models, area-based disaster mitigation and adaptation modules, and LKPD can be seen in the attachment. Based on these data, it can be said that the regionally-based disaster learning model in natural disaster mitigation material is in the appropriate category for use.

Based on the results of teacher responses and students 'opinions on the practicality of the learning model for natural disaster mitigation materials, it can improve students' skills, activities, and motivate students in learning and students are interested in learning because it is contextually integrated according to their experience so as to create a conducive atmosphere and make students interested in learning geography (Slinger, 2011). Student responses after the learning process using generally good and stated that the learning was interesting. This is shown by the response questionnaire data filled in by students, besides that students find it easy to follow learning using modules and LKPD because they provide the opportunity to learn independently and discuss as a group. The Effectiveness of Territorial Based Disaster Learning Model

The results of the assessment of the effectiveness of the learning model were carried out during the experimental class trials. The effectiveness of the learning model can be seen in the activities of students during the learning process by assessing the ability of students' skills and cognitive abilities of students in analyzing disasters in the area where students live (Alvarez, Salas, & Garofano, 2004; Huang & Chiu, 2015; Noesgaard & Ørngreen, 2015). Learning outcomes not only increase knowledge, but also improve critical thinking skills through concept building and disaster response. The application of an area-based disaster learning model for disaster risk reduction is designed to be able to increase the knowledge and skills of students in an effort to reduce disaster risk in the area where students live. In addition, student-centered learning teaches students to be more active independently digging for information and experiences to better understand learning material for later implementation in their lives (Boyadzhieva, 2016; Mccombs & Vakili, 2005).

Discussion and presentation activities in class as an assessment in the psychomotor domain of students help teachers in learning process assessment activities, and make students actively involved in the learning process because each stage in learning activities is assessed by the

teacher using a question and answer assessment rubric. In the positive rahnah assessment of learning outcomes using a written test assessment in the form of multiple choice questions totaling 20 numbers, daily assessments by working on questions on modules and student worksheets. Working on assignments in modules and LKPD is an individual task that is carried out in groups where in group discussions the sequence of bills is in the module and LKPD.

Based on the results of the acquisition of the psychomotor scores of students at each meeting, there was an increase with the average psychomotor score of 2.2. The psychomotor value or skills of students at the first meeting was 2.13, an increase in the second meeting, namely 2.22 assessment and the third assessment with an average of 2.25 active students in giving questions and providing answers logically according to facts and concepts. Psychomotor assessment is carried out during the learning process using a question and answer assessment rubric.

The analysis of the cognitive competence of students is shown by the results of the pre-test of students before the learning process using development products gets an average value of 61.5 with a percentage of 25% of students complete learning. While the post-test score obtained an average value of 76.75 with the percentage of classical learning completeness is 80%. Based on the results of the post-test cognitive assessment, although not 100% of the scores of students met the minimum completeness criteria in the geography subject of natural disaster mitigation material, all students experienced an increase in learning outcomes both in the cognitive and psychomotor domains. The product effectiveness test was carried out by looking at the differences in student achievement scores in KD disaster mitigation before being given treatment and after being given treatment, namely 0.4 in the moderate category based on the index criteria g. Thus it can be concluded that the learning outcomes of students classically have increased.

During the pre-test, students previously studied with available teaching materials such as worksheets and textbooks, while during the post-test students had been given treatment of the development product results. The increase in cognitive competence occurs because students can understand the learning material well and the questions arranged in the test have been designed based on indicators and learning objectives to be achieved in learning. In addition, the existence of modules and LKPDs help students to better understand the conditions of natural disasters in their area because the tools developed are contextual, while the textbooks and worksheets that students learn about the context of the material in general. Thus that learning tools can improve the cognitive abilities of students, help students achieve completeness of learning outcomes (individual and classical), and achieve the minimum completeness criteria that have been set by geography and school teachers and better understand the conditions of disasters in their region.

Based on the results of product development trials, the data obtained from the observation of the implementation of learning activities, data from observations of student activities, pre-test and post-test data, data on students' psychomotor abilities, and student response data. Data obtained during the trial such as the results of observations of the learning process and data on student learning outcomes, students' responses to the material and learning process are analyzed, then the results are used as consideration for further research, namely in the evaluation stage and to produce draft III products, so that they become tools. valid, practical, and effective learning. Draft III can be tested in SMA PASIGALA region and for wider dissemination, modules and LKPD can be added with material according to the target area of product development implementation.

Conclusion

The development product is suitable for use with the acquisition of an average value from

expert validators and practitioners that is 82%. The territorial-based disaster learning model is stated to be practical based on the results of the practicality questionnaire by the teacher, namely 80% with the practical or feasible category and the practicality questionnaire results by students which are 73 and based on the results of observations in the learning process in the class of active students in participating in all learning activities. The results of the effectiveness test were declared effective by looking at the differences in the achievement scores of students in KD mitigation of natural disasters before being given treatment and after being given treatment, namely 0.40 in the moderate category, in the cognitive domain the pre-test average scores of students were 61.5 and post-test of 76.75 with classical learning completeness 80% complete and in the psychomotor realm at each meeting an increase in the first meeting was 2.13, the second meeting was 2.22 and the third meeting with an average of 2.25. Thus the development product in the form of an area-based disaster learning model for disaster risk reduction can improve the critical thinking skills and skills of students in disaster risk reduction.

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