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How Effectively GO-GIS (Google Site Web-Based Multimedia Integrated with Geographic Information System) Can Increase Student's Critical Thinking Skill in School

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KEYWORDS
critical thinking skill; multimedia GO-GIS; effectively

ABSTRACT
This study aims to develop GO-GIS multimedia and determine the effectiveness of GO-GIS to improve students' critical thinking skills in disaster mitigation and adaptation materials. This research refers to the ADDIE development model which consists of analysis, design, development, implementation, and revision. The product feasibility test was assessed by 1 media validator, 1 material validator and student responses. The results showed that (1) GO-GIS learning media was feasible to use, the results of the feasibility assessment by material experts obtained a score of 4.73, the feasibility assessment by media experts obtained a score of 4.82, the user's response in small group trials obtained an average 4.45. Score indicates very decent. (2) GO-GIS multimedia proved to be effective as a learning medium and there was an increase in students' critical thinking skills in the experimental class (GT = 0.50, N = 35) in the medium category when compared to the control class (GT = 0.23, N = 35) in the moderate category (GT = 0.23, N = 35) in the low. The results of the independent t-test show the sig. 0.03 (sig value < 0.05) and it can be concluded that there is a significant increase in students' critical thinking skills in disaster mitigation between the Experiment class (mean 78.57) and the control class (mean = 71.88).

Introduction

Nowadays, learning in the 21st Century teachers and students are both required to have qualified technological literacy. This is because the technology used in learning can be used as a tool in visualizing material, and helping motivate students to learn. Therefore, various skills such as the ability to communicate, collaborate, think critically and creatively and problem solving accompanied by a qualified mastery of technology are absolute requirements to be mastered in the 21st century (Maria et al., 2019).

In geography learning the use of technological aids is necessary because basically learning geography provides students with an understanding of geography. With this technology, geography material can be visualized and described easily so that students

can understand and hone their critical thinking, analytical and problem solving skills (Rahayu et al., 2021).

However, in practice there are obstacles encountered so that the learning objectives achieved are not optimal. As evidence, questionnaire data distributed to several high schools in Jember Regency showed that 58.42% of students found it difficult to learn geography material because the study was quite complex. In addition, 25.56% of students also assumed that geography material was closely related to earth phenomena (Lucius, 2023). However, there were only 2.10% of students giving positive answers with the assumption that learning geography was very fun. While 6.31% of students responded by explaining that the obstacle when learning geography material was the use of media that was not yet qualified. For example, when students receive practical assignments to compile reports on the distribution of flora and fauna in Indonesia, many do not understand it because there are no supporting maps as learning media. This is in line with the opinion (Silviariza et al., 2021) which describes that geographical phenomena or objects that are abstract in nature require tools in the form of media to explain them. Constraints in studying geography material are generally caused by weak creativity and media innovation implemented by teachers in learning (Dewi, 2022).

Analysis of the results of interviews with geography teachers at Arjasa State Senior High School showed that disaster mitigation and adaptation material in the 2013 curriculum was one of the most difficult materials for students to understand and implement (Hendarman, 2013). They need a long time to understand the potential for disasters in a large area of Indonesia, such as: the distribution of potential disasters such as landslides, earthquakes, and the results of Indonesian volcanic eruptions. In fact, natural and non-natural disasters often occur in Indonesia. If students do not understand the material well it is feared that when there is a disaster around their place of residence they will not have the knowledge to be able to make the right decisions. Students also do not have knowledge about potential disasters in the surrounding area so that their disaster adaptation abilities are not maximized (Darwiningtyas, 2020).

Based on the results of the FGD above, the concept of natural disaster mitigation and adaptation material needs to be adapted to the environmental conditions where students study and media is presented to make it easier for students to understand material, such as images, text, animations and videos that aim to support existing disaster information (Anggarani, 2021). Furthermore, the media needs to include a map of the distribution of natural disaster-prone areas in Jember Regency so that students can interpret each area prone to natural disasters and apply critical thinking skills, which are equipped with pictures, sound and videos that explain concretely examples of natural disasters that have occurred (SAMSUDIN et al., 2019).

Types of learning media are very varied. Teachers can use it according to the needs of the material in the student learning process. The types of media in question include visual, audio, and audiovisual. While the combination of various media is usually known as multimedia. The types of multimedia are also very diverse, there are in the form of flash multimedia, web multimedia, and others. In general, multimedia is equipped with guides and controllers to make it easier for users to operate (Sidauruk et al., 2020).

Web-based learning multimedia can be used as an alternative choice of distance learning media (Irwandani et al., 2019). This is because the web can be used as a learning tool to improve student abilities so that it can have a positive impact (Mukti et al., 2020). Web-based multimedia can also be used as an alternative to geography learning either with synchronous or asynchronous methods. One of the platforms that can be utilized by

teachers in creating web-based multimedia for easy and efficient geography learning is the Google Site (WGS) (Ulinnuha, 2020).

WGS is quite easy to operate for beginners because it is free access and does not use complicated code or programming languages. Another advantage of WGS is the ease of quickly accessing the required information and being able to attach various photo, video, document, and animation files through the features of WGS. It can even be integrated with various websites into one like webGIS. According to (Sm, 2016), Web GIS provides some of opportunities to get full access to our authoritative GIS data, enabling you to move from your system to a system of engagement that facilitates everything from self-service mapping to make it better decisions (Iqbal et al., 2021).

The development of Google Site Web-based multimedia integrated with WebGIS as a medium in geography learning is expected to be effective in increasing students' critical thinking skills and making learning more meaningful for students. Therefore, it is important to develop GO-GIS (Google site Web-Based Multimedia Integrated with GIS) multimedia (Mustari, 2023).

Research Methods

This development research uses the ADDIE method. This method is considered appropriate because it has systematic and effective steps for creating learning media products. The ADDIE development model consists of 5 steps, namely analysis, design, production/development, implementation, and evaluation (Sugihartini & Yudiana, 2018). Each stage has a different process and understanding. All processes must be carried out according to the development method so that the products created can be said to be a scientific approach. This development model begins with analysis activities. The analysis in question relates to student needs and problems that occur in the field. Furthermore, the design is related to storyboards and illustrations regarding GO-GIS media products. The next stage if the design has been completed is media production/development. At this stage the researcher carried out the process of growing accurate data, materials and information as content material for GO-GIS multimedia products. Before moving on to stage four, it is necessary to conduct validity tests by material and media experts. Implementation is the next stage. The trial of the GO-GIS multimedia product is adjusted to the plan and timeline that has been approved by the school principal and teaching teachers. The developed GO-GIS Multimedia is expected to be able to build competence, knowledge, and critical thinking skills, especially in disaster mitigation and adaptation materials.

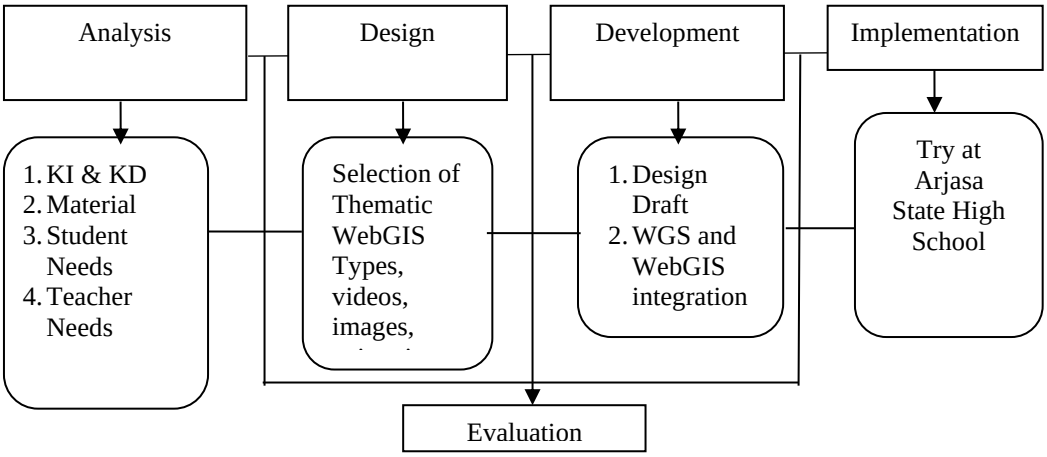


Figure 1 Procedure for Developing GO-GIS Multimedia Natural Disaster Mitigation and Adaptation Material According to the ADDIE model.

Results and Discussions

Result

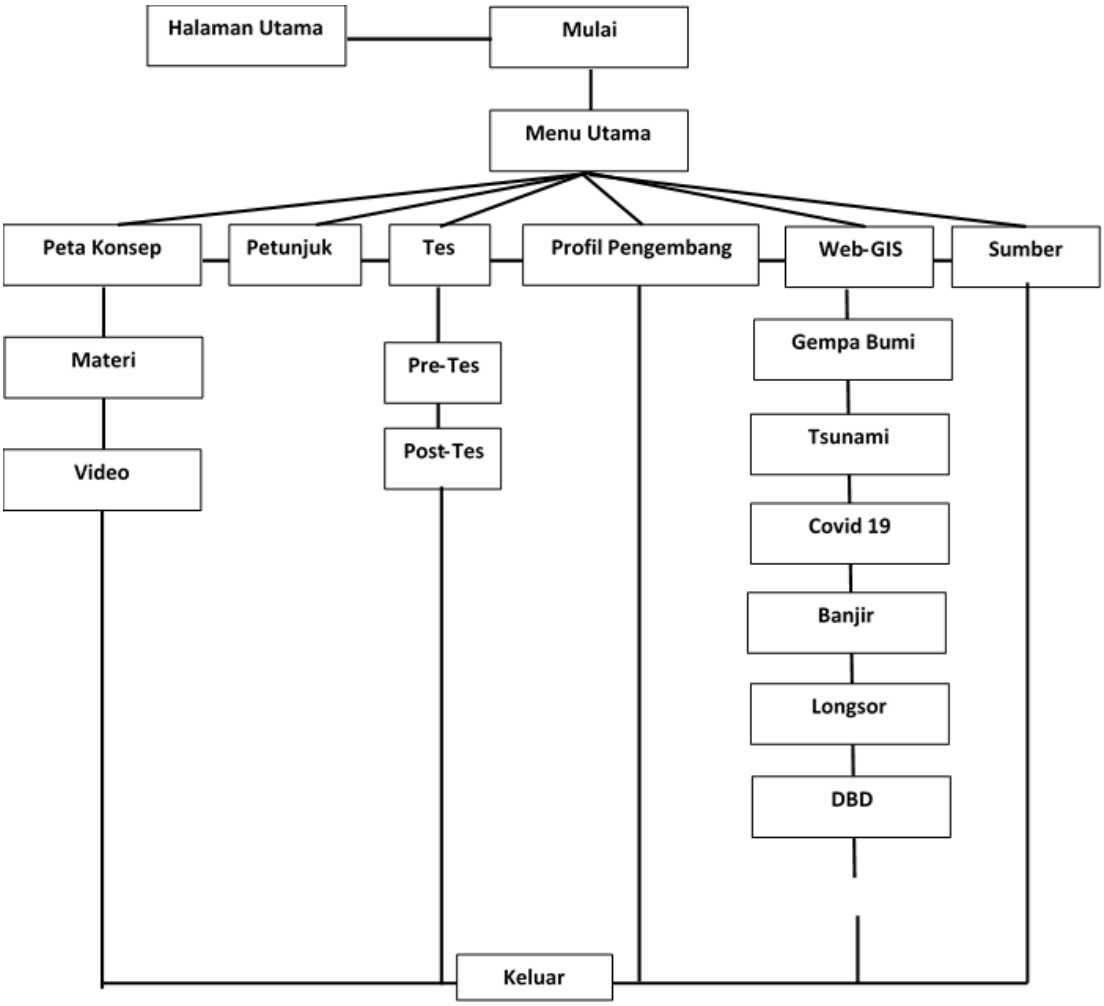
The product produced in this development research is a GO-GIS multimedia material on disaster mitigation and adaptation to improve the critical thinking skills of class XI students of SMA Arjasa, Jember. A complete display of GO-GIS multimedia products can be seen in the attachment. This product development is carried out in accordance with scientific principles using the ADDIE development theory with 5 stages.

a) Analysis

This stage is the first step to be able to identify problems that occur in the field. Needs analysis is carried out at this stage of learning activities related to improving students' critical thinking skills. This stage consists of several steps, starting with an initial analysis, analyzing student needs, and analyzing teacher needs.

b) Design

After the analysis is done, the next step that needs to be done is design. At this stage the process is divided into several things. First, develop the initial content, make a flowchart and storyboard. Flowchart is a flow of ideas in the development of GO-GIS multimedia. In this section, important points are arranged which become the flow of development. Each component on the flowchart is interconnected and connected. This flowchart also serves as a workflow for developing GO-GIS multimedia products on disaster mitigation and adaptation materials. Storyboards are a follow-up to flowcharts. In this section, the discussion is more detailed because each display is discussed in detail. The storyboard also displays the positioning layout of certain items such as menu buttons, next and back buttons and several other functions that are used to simplify the design process later.



Picture 2 Flowchart of multimedia GO-GIS

c) Development

Development is the next stage after the design process produces storyboard output. At this stage the main activity carried out is multimedia production using the guidelines that have been prepared previously. In this section the stages are divided into several things: preparing the text, creating graphics, assembling the pieces, supporting materials, and validation. These some of picture of multimedia GO-GIS.

Figure 3 Menu of GO-GIS

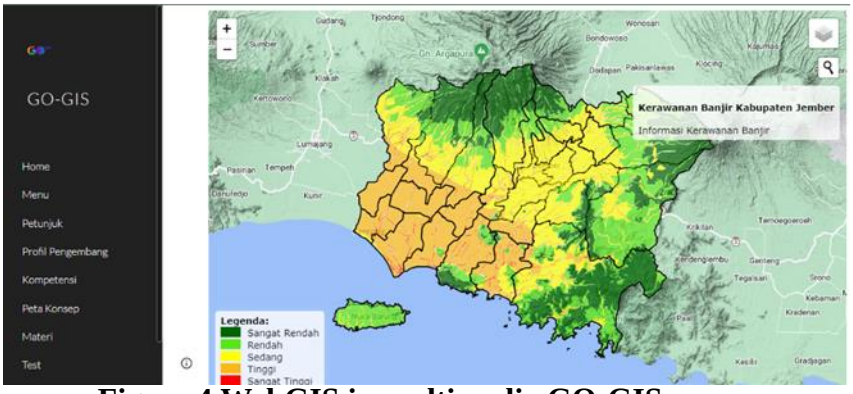


Figure 4 WebGIS in multimedia GO-GIS

d) Implementation

There are two stages in product trials, namely small group trials and large group trials. Small group trials were conducted in order to determine the feasibility of the media, while large group trials were conducted to determine the effectiveness of the media. The domain of acceptance of multimedia consists of guides and information, multimedia materials, evaluations, design and media facilities, pedagogical effects, and responses from users.

e) Revision

In this section the activities carried out are product improvement. Suggestions and input from validators and users are the main reference

Discussion

Product trials were carried out by testing media experts and material experts. Meanwhile, the field test or effectiveness test was carried out by 35 students of IPS 3 class at SMA Negeri Arjasa, Jember. Each expert conducts an analysis according to his area of expertise. The results of expert validity are used to improve GO-GIS multimedia products. If it is felt that it has fulfilled the input and suggestions from the validator, then the steps can be continued to be tested in the field with predetermined research subjects. The results of the validation test on media feasibility by material experts and media experts are presented in the following picture.

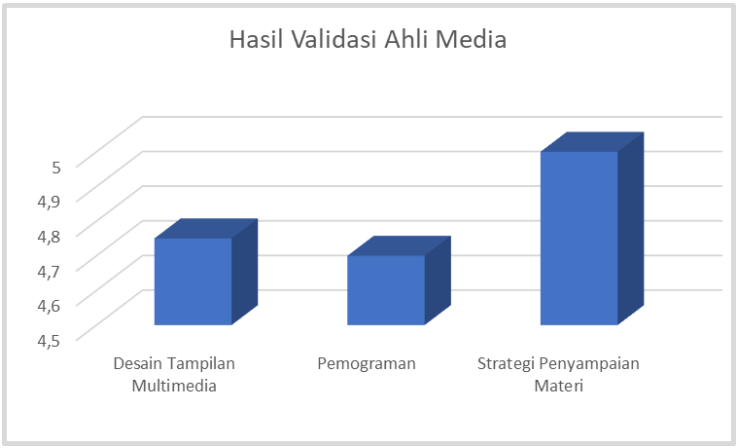


Figure 5 Graph of Media Expert Validation Results

It explained that the lowest average was in the programming aspect. This is because there are functions that need to be evaluated such as video and music position which cannot autoplay when GO-GIS multimedia is opened. However, the material delivery strategy aspect received high marks because the material contained in GO-GIS multimedia was quite comprehensive and coherent accompanied by practice questions using Web-GIS so students could use their critical thinking skills to the fullest. The conclusion of the validation from media experts that the GO-GIS learning media was declared feasible for further field trials.

The next validity test is the validity of the material expert. In this section a test is conducted to determine the feasibility of the material compiled in GO-GIS multimedia. Furthermore, the material prepared is also assessed and evaluated by the validator whether it is in accordance with the learning objectives and competencies to be achieved.

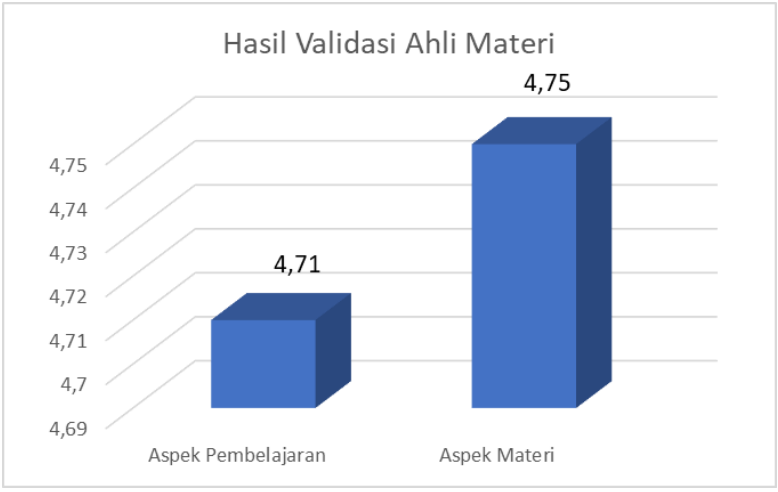


Figure 6 Graph of Material Expert Validation Results

After the questions are declared valid and reliable, then a test must be carried out on the improvement of students' critical thinking skills. The increase is measured by the analysis of Normalized Gain (GT). Gain test results are presented in the following table.

Table 1 Normalized Gain Value

No	Information	Rerate Pre-test	Rerata Post-test	GT
1	Control Class	53,94	71,88	0,23
2	Experimental Class	61,20	78,57	0,50

Based on table 1, the pretest and posttest results for each control and experimental class experienced an increase. The control class that used Power Point media during the pre-test had an average of 53.94 points, while during the post-test it obtained a class average of 71.88 points. The control class obtained a GT score of 0.23 and was included in the low category (0 > GT <0.3). The experimental class that was given treatment using Geolitera media obtained an average pre-test of 61.20 and a post-test of 78.57. The GT score for the experimental class reached 0.50 which can be interpreted as a moderate increase (0.3 >GT < 0.7).

Analysis of the effectiveness of GO-GIS media using independent t-test. Before conducting the t test, it is necessary to carry out prerequisite tests, namely the normality test and homogeneity test. The normality test was carried out using the Kolmogorov-Smirnov test (because the number of respondents was > 30) in the SPSS application. The test results are presented in the following table.

Table 2 Descriptive statistical results of independent t-test on pretest

	Class	N	Mean	Std. Deviation	Std. Error Mean
Pretest	Experimental Class	35	61.2000	12.23015	2.06727
	Control Class	35	53.9429	11.10893	1.87775

Table 3 Independent sample test results on pretest values

		Levene's test for equality of Variances		t-test for Equality of Means		
Pretest	Equal variances assumed	F	sig	t	df	Sig.(2-tailed)
		1.234	0,271	2.599	68	0,11
	Equal variances not assume d			2.599	67.381	0,11

Based on the table of independent t-test results for the pretest value, it has a significance (2-tailed) of 0.11. sig. value (2-tailed) obtained > from 0.05, the results can be interpreted that there is no significant difference between the results or pre-test scores of students in the control class and the experimental class. Furthermore, the results of the independent t-test for the posttest can be seen in the table below.

Table 4 Descriptive statistical results of independent t-test on posttest

Posttest	Class	N	Mean	Std. Deviation	Std. Error Mean
	Experimental Class	35	78.5714	11.82541	1.99886
	Control Class	35	71.8857	14.27827	2.41347

Table 5 Independent Sample Test Results On Pretest Values

		Levene's test for equality of Variances		t-test for Equality of Means		
Pretest	Equal variances assumed	F	sig	t	df	Sig.(2-tailed)
		1.629	0,206	2.133	68	0,36
	Equal variances not assume d			2.133	65.719	0,37

Based on the table, it can be seen that the average posttest result for the experimental class is 78.57 points, while the average value for the control class is 71.88 points. Higher posttest scores indicate that students in the experimental class experienced a higher increase in critical thinking skills using GO-GIS media when compared to the control class using Power Point media.

Conclusion

Based on the process and results of this GO-GIS multimedia development research, there are several conclusions that become important information. The conclusions in question include (1) The results of the feasibility assessment of the material validator obtained a score of 4.73 indicated in the very feasible category. While the results of the feasibility assessment of the media validator obtained a score of 4.82 which indicated that it was in the very feasible category. The results of user (student) responses obtained a score of 4.45 included in the very feasible category in the small group trial, and a score of 4.56 was included in the very feasible category during the large group trial, (2) GO-GIS media has been tested to be effective and can help students improve their critical thinking skills. Class XI IPS 3 using GO-GIS media obtained a higher average than the control class using conventional learning media.

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