



## The Influence of Implementing the Geography Virtual Laboratory (Geovlab) on Interest and Increasing Academic Achievement Abilities

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### ABSTRACT

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**Purpose:** This research aims to examine the effect of implementing a virtual geography laboratory (Geovlab) on students' interest and increasing academic achievement.

**Patients and methods:** The type of research used is experimental research. The research was conducted at SMA Plus Al-Fatimah Bojonegoro, East Java, Indonesia. The subjects of this research were 60 students. The research instruments used to collect data were interest questionnaires and cognitive measurement tests. Data analysis was tested using percentages and paired sample t test statistics.

**Results:** Based on the analysis of research results, it shows that there are students who have a high interest in using Geovlab and there is a significant average difference between pre-test and post-test in cognitive aspects of academic achievement.

**Conclusion:** Geovlab allows students to learn geography interactively. They can explore geographic maps, simulations, and models that help them understand geographic concepts better than traditional textbook-only learning.

### KEYWORDS:

Geovlab, Geography, Academic Achievement Abilities

### 1. INTRODUCTION

Geography learning at SMA Plus Al-Fatimah Bojonegoro is carried out by providing worksheets. The teacher explains the concept then continues with practicing questions on the Worksheet. Meanwhile, practical work is difficult due to limited laboratory space. At Al-Fatimah Plus High School there is no laboratory space for the Social Sciences subject group. The limited laboratories for geography subjects mean that geography learning is not optimal.

In studying geography, field practicum is a very important lesson. Geography as a science is closely related to field and laboratory studies as a concrete manifestation of theory in developing intelligence and knowledge (Shaherani et al., 2022). The advantage of practicum is that it can make students practice by trial and error, and repeat activities/actions until they are completely skilled (Putra et al, 2021). Practical activities are a real provision to equip geography graduates in the world of work. A virtual

laboratory can be a solution for field or room practicums for geography learning. Along with the development of the world of information technology today, experts are trying to develop various computer-based learning media (Tatli, 2013). There are electronic books (ebooks), animated videos, interactive videos, PowerPoint slides, various flash programs and even virtual laboratories. All types of media really help teachers in conveying information to students during the teaching and learning process, and good application of media will increase student learning success. Nana & Rivai (2010), provides a number of reasons why the use of learning media can improve students' academic achievement. Some of the benefits are that the use of learning media can attract students' attention so that it can foster learning motivation. It is hoped that through the use of learning media the learning materials will be easier and clearer for students to understand.

To overcome the problems found, one effort that can be done is to use interactive learning media. One form of learning media is virtual laboratory media. Toth and Morrow (2012), believes that a virtual laboratory is a form of laboratory with observation or experimental activities using software run by a computer, all the equipment needed by a laboratory is contained in the software; A virtual laboratory is an experiment that uses learning simulations (software) and

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computers to carry out important laboratory functions like normal experiments (Amin & Hafiz, 2012).

A virtual laboratory is a laboratory on a computer/laptop device that students use to carry out experiments with applications without the need for real laboratory equipment. Bastian & Idrus, (2019) states that a virtual laboratory is a form of multimedia object that is interactive and can be controlled; Virtual laboratories have several advantages. These advantages include being able to explain abstract concepts that cannot be explained through verbal delivery (Widarti, et al., 2021). A virtual laboratory can be a place to carry out experiments that cannot be carried out in a conventional laboratory.

In Geography learning, innovation needs to be carried out. Geography learning should not be dry and stop at material in the classroom (Widyanto et al, 2018). The implementation of Geovlab learning can broaden understanding of the material through studying phenomena that exist in the field directly as a result of human activity intervention (Putra et al., 2021). For this reason, it is necessary to have a Geovlab that explores the potential of the real environment as dynamic geographic material. For this reason, it is urgent that efforts be made to increase integrated mastery of Geography material for students. One effort to improve mastery of integrated Geography material is by learning through the use of Geovlab to improve students' abilities in constructing new knowledge. In Geovlab, students can carry out geography experiments and practicums without having to go to the field or use physical equipment. They can observe geographic phenomena directly through simulations and practice geography skills with the help of technology. This gives them better practical experience in understanding geography concepts and improves their skills in analyzing and solving problems. It is hoped that the application of Geovlab can make learning easier for students. According to Supahar & Widodo (2020), the advantage of the virtual laboratory learning media developed is that it can present material in an interesting and easy to understand manner as well as presenting examples of varying problems with different levels of difficulty.

Virtual laboratories can help students better visualize geographic concepts through the use of interactive maps, satellite imagery, and three-dimensional models. This can help them understand complex geographic phenomena more easily. Virtual geographic laboratories allow access to various types of geographic data, maps, satellite imagery, and geospatial analysis tools without having to physically be in a specific location. This gives students the flexibility to explore and understand geography concepts anytime and anywhere. In virtual laboratories, students can carry out experiments and simulations safely without any real risk. For example, they can examine the impact of climate change on changes in Earth's surface temperature or observe the movement of tectonic plates through simulation models. Virtual

laboratories can also give students the opportunity to study independently, allowing them to explore topics that interest them in more depth.

Based on the conditions explained above, the aim of this research is directed at analyzing the effect of implementing Geovlab on student interest in learning and increasing student academic achievement in geography subjects for class X at SMA Plus Al-Fatimah Bojonegoro.

## II. GEOVLAB PRODUCT SPECIFICATIONS

The explanation of Geovlab product specifications is to describe some of the software used in this programming which is a combination of image processing software, animation software, simulation software and display management software. For image processing, Adobe Photoshop, Macromedia Flash Professional 8 are used. So that the program can be created as expected, the use of several of these devices is an option that must be used. This is because no single software can accommodate all programming needs carried out. The procedural stages of Geovlab programming activities are shown in the following figure.

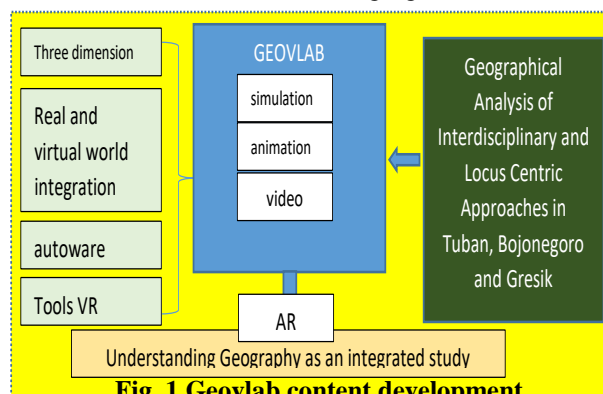


Fig. 1. Geovlab content development

## III. METHOD

This type of research is experimental research. This research compares the effect before and after learning using Geovlab on students' academic achievement in geography subjects, and describes how students respond to their interest in using Geovlab in geography learning. The subjects in this research were all class X students at SMA Plus Al-Fatimah Bojonegoro, East Java Province, Indonesia. The research design was a random pretest - posttest design. Researchers carried out observations in the form of giving questionnaires regarding interest in using Geovlab and understanding tests twice, namely before and after learning.

The instruments used are: 1) student response questionnaire sheet. The questionnaire method is used to collect information about students' opinions regarding learning using virtual laboratory media. The questionnaire used in this research is a closed questionnaire in the form of a check list. Students just need to put a check mark (√) in the column provided. Questionnaires are used after learning is carried out; 2) This learning outcomes test question sheet contains questions that students must work on regarding geography

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material. The test questions have first been validated by material experts. Interest analysis uses the percentage method, while analysis of student academic achievement tests uses parametric statistics. The parametric statistics used is the paired sample t test.

**IV. RESULTS AND DISCUSSION**

**A. Results Student interest in using Geovlab**

A student response questionnaire is needed to find out how interested students are in learning using Geovlab. There were five questions asked by researchers. Student interest questionnaires are given after the learning is carried out. The results of the recapitulation of interest are presented in Table 1 below.

**Table 1. Students towards learning**

No	Question	Answer		Percentage	
		Yes	No	Yes	No
1	Is using Geovlab something new for you?	56	4	93	7
2	Does using Geovlab make it easier for you to understand geography independently?	52	8	87	13
3	Does using Geovlab make it easier for you to complete the questions and assignments given by the teacher?	48	12	80	12
4	Does using Geovlab make you more motivated to study geography?	50	10	83	17
5	Is the use of Geovlab good if used for other subjects?	24	36	40	60

According to Table 1, it is known that 56 people or 93% of students said that using Geovlab was something new. The remaining 4 students or 7% said that learning in this way was nothing new. Students don't just learn through the textbooks they have been working on. Learning using Geovlab is in line with government instructions which state that students should be introduced to the world of information technology. According to Cox et al. (2023), Learning with learning media will show students progress in the world of computer information technology. Because the use of media during the learning process will directly involve students operating the media and observing the sophistication of information technology that is currently developing.

According to Table 1, it is known that 52 people or 87% of students said that using Geovlab made it easier to understand lessons independently. The remaining 8 students or 13% said

that learning in this way did not make it easier to learn the lesson. The students' opinions in this case are in line with the dual code theory. Where the dual code theory states that information presented in visual as well as verbal form will be easily included in students' long-term memory structures, Nur (2008). The information displayed by Geovlab learning media is in visual form in the form of geospheric phenomena. With a virtual geography laboratory, students can access geography material and practicum anytime and anywhere. This allows them to study independently and repeat difficult material as many times as they need. Thus, they have a better chance of understanding geography concepts better.

According to Table 1, it is known that 48 people or 80% of students said that using Geovlab made it easier to complete the questions and assignments given by the teacher. The remaining 12 students or 20% said that learning in this way did not make it easier to complete the questions and assignments given by the teacher. This is in line with the theory put forward by Nur (2008) which states that students will tend to be able to complete tasks where the situation during the test is the same as the task situation being exemplified. When the teacher presents material through Geovlab and students receive a written test, there is a difference between the material presentation situation and the situation during the test. Therefore, it is natural that only 56.14% of students said that the media made it easier to complete the assignments given by the teacher and 43.89% said Geovlab did not help in completing the assignments given by the teacher. Virtual geography laboratories often include features such as audio and visual explanations, interactive exercises, and immediate feedback. This allows students to learn at their own pace and get better individual support (Wijayanto, 2018). Through virtual laboratory learning, students can repeat difficult material, test their understanding through exercises, and receive immediate feedback to correct their mistakes (Muhajarah & Sulthon, 2020). They can practice freely on the questions and assignments in Geovlab. Thus, they have a better chance of improving their academic performance.

According to Table 1, it is known that 50 people or 83% of students said that using Geovlab made students more motivated to study chemistry. The remaining 10 students or 17% said that learning in this way did not make them more motivated to study geography. There are more students who feel motivated by the virtual laboratory than those who are not motivated. This is in accordance with the opinion of Sadiman (2012) who said that learning media will create enthusiasm for students' learning. Findings The results of Tüysüz's (2010) research show that when compared with traditional teaching, virtual laboratories have a positive impact on increasing student motivation, attitudes and learning achievement.

According to Table 1, it is known that 24 people or 40% of students said that using Geovlab was good if used for other

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subjects. The remaining 36 students or 60% said that learning in this way was not good if used for other subjects. Other subjects may not necessarily be able to use Geovlab. For example, sports and arts subjects will be better if they use direct practical learning. Geovlab can only be applied to geography subjects.

**B. Research Results of Academic Achievement Tests**

The academic achievement test assessment is obtained after students complete the pre-test - post-test questions. Before carrying out the t test, the sample normality requirements are tested.

**Table 2. Normality Test**

Class		Shapiro-Wilk		
		Statistic	df	Sig
Results Study	Pretest	0,9	60	0,07
	Posttest	40	60	3
		0,9		0,08
		41		6

a. Lilliefors Significance Correction

The results from table 2 obtained a sig value. The Shapiro Wilk normality test shows that the sig. amounting to 0.073 (pretest), 0.086 (posttest). From the results of the Shapiro Wilk normality test, it shows a sig. >0.05 so it can be concluded that the research data used is normally distributed, so the statistics used are the t test.

The paired sample t test is used to determine whether there is a difference in the average of two paired samples. The two samples in question are the same sample but have two data. In this research, each class has two data originating from pretest and posttest scores. The paired sample t-test is part of parametric statistics, therefore, the rules in parametric statistics are that research data must be normally distributed. The results of the paired sample t-test in this study are presented in the following table :

**Table 3. Paired Sample T-Test Results**

Paired Sample T-Test					
Pair 1		Mean	N	Sig. (2-Tailed)	
	Pre_Test	74,421	60		0.001
	Post Test	82.532	60		

The results of table 3 show that the mean score obtained on the pretest was 74,421 and the posttest was 82,532. Testing the research data using a paired sample t test shows that the sig. (2-Tailed) of 0.001 < 0.05, this indicates that H0 is rejected and Ha is accepted. So it can be concluded that there is a significant difference between the use of Geovlab on pretest and posttest data.

It can be explained that Geovlab has a vital role when learning takes place which causes an increase in academic achievement in geography from a cognitive aspect. The

existence of Geovlab makes students motivated to study geography material until they understand and comprehend the geography material. This is reinforced by the results of research from Arif et all. (2021), stating that virtual geography laboratories are very suitable for replacing learning in the field and increasing conceptual understanding of concepts regarding geosphere phenomena; The use of virtual laboratories can train students to discover and develop process skills and provide guidance for teachers and students in achieving understanding of concepts (Hamilton et all., 2021). The findings of Al Hasan (2016), also strengthen that the application of virtual laboratories in learning has a positive impact on increasing the academic achievement and learning motivation of Sudanese Middle School Students.

The use of Geovlab in this learning has a manipulative function. According to Asyhar (2012), the manipulative function of media because it is related to the simulations contained in this media is able to display objects or situations that describe actual objects or situations. Practical simulations for planting bacteria and evaluation are delivered interactively because students can be directly involved in operating the media according to each student's learning speed. Active student involvement in these simulation activities allows students to build their own knowledge. This is in line with Rouse's opinion in Sardiman (2011) that all knowledge must be obtained through one's own observation, one's own experience, one's own investigation, one's own work, with one's own facilities, both spiritual and technical. Virtual geography laboratories can also facilitate collaboration and communication between students and teachers. They can share understanding, ideas and knowledge through discussion forums, collaborative projects and virtual meetings. This can improve students' understanding of geography concepts and broaden their horizons through interactions with classmates and teachers.

Learning through Geovlab makes geography learning whose material is abstract more concrete. In the opinion of Demicri (2003), through virtual laboratories, students can develop concepts from difficult ones to easier ones, here abstract topics can be manipulated by students through an interactive learning environment through simulations and animated concepts; Students easily express their reactions when carrying out simulations quickly so that they can increase interest and learning achievement (Karamustafaoglu et all., 2005). Virtual geography laboratories are often equipped with animations, simulations, and interactive games that allow students to learn in a more interesting and fun way. This can increase students' interest and motivation in studying geography, which in turn can improve their academic achievement. In conclusion, the use of virtual geography laboratories can have a significant positive influence on increasing student academic achievement. Better accessibility, interactive learning, better practical



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experiences, better individual support, and better collaboration are some of the positive impacts that can occur.

### V. CONCLUSION

Geovlab geography learning has received a positive response from students with very high interest, this is because learning with Geovlab is something new, learning independently, increasing learning motivation, and helping with questions and assignments. Students' academic achievement after learning by applying Geovlab in geography subjects in class X high school shows that there is a difference in average scores before and after learning. Geovlab allows students to learn geography interactively. They can explore geographic maps, simulations, and models that help them understand geographic concepts better than traditional textbook-only learning

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