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The Effect of Interactive Multimedia on Students' Learning Outcomes Regarding the Impact of Geosphere Phenomena

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Abstrack
The integration of multimedia elements in learning processes has been widely recognized for its potential to enhance student engagement and comprehension. This study investigates the effect of interactive multimedia on students' learning outcomes related to the impact of geosphere phenomena on life. The research employed a quantitative approach using a one-group pre-test and post-test design. A total of 32 students participated in the study, and data were collected through objective tests administered before and after the use of interactive multimedia. The collected data were analyzed using simple linear regression to determine the effectiveness of the intervention. The results revealed a notable improvement in students' scores, with the average pre-test score of 50.69 increasing to 83.75 in the post-test. Pre-test scores ranged from 25 to 70, while post-test scores ranged from 70 to 95. Statistical analysis showed a significant difference between pre- and post-test results, and the regression analysis yielded a significance value of 0.000 ($p < 0.05$), indicating a meaningful effect of the treatment. The R Square value of 0.462 suggests that 46.2% of the variation in student learning outcomes can be attributed to the use of interactive multimedia. These findings confirm that interactive multimedia significantly enhances students' understanding of geosphere-related concepts in science education.

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Introduction

Technological advancements in the field of education have transformed the way individuals access information, communicate, and engage in learning (Susi et al., 2025). The integration of technology into the learning process offers both students and teachers greater opportunities to enhance instructional quality and achieve improved learning outcomes (Resti et al., 2024). Educational technology has played a significant role in shaping contemporary pedagogical practices (Purba & Saragih, 2023). It enables teachers to deliver instructional materials more efficiently through various learning media (Mahfuz, 2021). Learning media constitute a crucial component of teaching and learning activities (Furoidah, 2020). In classroom practice, teachers frequently utilize media as an intermediary to facilitate students' understanding of instructional content (Zahwa et al., 2022).

The benefits of learning media are to standardize learning materials, learning activities become more fun, the learning process is more interactive, learning time can be reduced, learning quality increases, learning can be done anytime and anywhere, positive attitudes towards the learning process can be improved and the role of teachers changes in a more positive and productive direction (Fadillah et al., 2023). Utilizing technology in learning activities provides students to gain an active learning experience, improve problem-solving skills, and students can explore more knowledge (Belva et al., 2024). One type of media that uses the help of technology is interactive multimedia.

Interactive multimedia learning media is a media medium in which there is a combination of various forms of information such as text, animation, graphics, video or sound (Hingide et al., 2021). The use of interactive multimedia as a learning medium can be used to overcome several obstacles for students who have different learning style characteristics (Damayanti et al., 2020). Interactive multimedia learning media allows for direct interaction between students and learning resources (Yuningsih & Haeruddin, 2024). Through interactive multimedia, the learning process becomes more interesting and effective so that it can improve student learning outcomes (Rusfriyanti & Rondli, 2023).

The media used in learning has an influence on student learning outcomes (Nisa et al., 2021). Learning outcomes are the results given to students in the form of assessments after participating in the learning process by assessing the knowledge, attitudes, and skills in students with changes in behavior (Nurfadhillah, 2021). Student learning outcomes in geography subjects at SMA Negeri 2 Range, especially class X, are relatively low, this can be seen from the data of student tests in 2024 on the impact of geosphere phenomena on life.

Table 1. Results of complete and incomplete student exams 2024

Class	Complete	Percentage	Incomplete	Percentage
X-1	23	64%	13	36%
X-2	17	47%	19	53%
X-3	22	62%	14	38%
X-4	17	47%	19	53%
X-5	16	44%	20	56%
X-6	23	64%	13	36%
X-7	20	56%	16	44%
X-8	24	66%	12	34%
X-9	20	56%	16	44%

The recapitulation table of student exams that are not completed in 2024 on the material on the impact of geosphere phenomena on life above can be seen that the total number of test scores of class X students at SMA Negeri 2 Kisaran still has scores below the KKM. The class with the highest number of students who did not complete the test material on the impact of geosphere phenomena on life in 2024 was class X-5 with a percentage of 56% incompletion. Seeing these problems, the use of simple learning media such as book media is less effective in improving student learning outcomes. Therefore, the use of learning media needs to be considered so that student learning outcomes increase.

The interactive multimedia used in the research will be carried out using Canva, Word Wall and Google Classroom media. The reason for choosing this media is that the material on the impact of geosphere phenomena on life is quite difficult to understand if it does not involve interactive learning. This material is seen as difficult because it requires an overview for students so that students can understand the material (Noviana et al., 2024). Therefore, it is necessary to have animated pictures and videos in explaining the material on the impact of geosphere phenomena on life to students. Animated images and videos aim to make students better understand and understand through the view they see (Putri et al., 2022). Animated images and videos can be used through interactive multimedia such as Canva, Google Classroom and Word Wall. Canva is used to deliver teaching materials through animated videos (Azgiyya et al., 2023). Google Classroom is used to store and share teaching materials with students so that they can be re-learned at home without a time limit (Mu'minah & Gaffar, 2020) and Word Wall is used to evaluate teaching materials to find out students' understanding of the material that has been learned (Sinaga & Soesanto, 2022).

A lot of research on learning media has been conducted, especially in the context of improving student learning outcomes. However, research related to the use of interactive multimedia in geography learning is still rarely used, especially those that discuss the impact of geosphere phenomena on life at the high school level. This research has a novelty with a focus on interactive multimedia variables using 3 media, namely Canva, Google Classroom and Word Wall on learning outcomes by using pre-tests and post-tests to measure them. Previous research only used 1 media in using interactive multimedia. The results that will be obtained in this study are different from the previous research in terms of the selected research design, namely the previous research using a two-group class research design.

This study uses a one group classes research design, which only focuses on the achievement of student learning outcomes for the class studied based on observations of class values that are relatively low in the material on the impact of geosphere phenomena on life in 2024. The main focus of using the one group class design is the real school score conditions based on Table 1, the time and resource efficiency that requires more time to use the experimental class and the control class. Furthermore, the main objective of the study is to focus on looking at the differences in learning outcomes before and after treatment (interactive multimedia media) in low-income classes, rather than comparing between class groups.

Interactive multimedia media can be used to improve student learning outcomes (Damayanti et al., 2020). Through interactive multimedia, it helps teachers in teaching more effectively and helps students to accept and understand teaching materials in geography subjects, especially in the material on the impact of geosphere phenomena on life that the

researcher will implement. The purpose of this research was to determine the influence of learning outcomes obtained using interactive multimedia. The expected benefit is that student learning outcomes, especially in geography lessons, increase by using interactive multimedia at SMA Negeri 2 Kisaran.

Method

The research was conducted at SMA Negeri 2 Kisaran, Kisaran City in May – June 2025. The sampling technique uses purposive sampling, namely by choosing the lowest class with learning results, namely class X-5. Validity and realism were carried out for 25 questions and 10 questionnaire questions. The results of the validity of the valid questions were 20 and the reliability test was declared reliable at 0.899. The validity results for the questionnaire of all 10 questions were valid and the reliability test was declared reliable at 0.799. The research design uses one design group for post-test and pre-test. The data analysis technique uses simple linear regression with the test stages, namely the normality of sig values. > 0.05, the linearity of the sig value. < 0.05, test the sig value hypothesis. < 0.05 and a determination coefficient test to see the magnitude of influence (Oktaviyanti et al., 2022). The learning process uses interactive multimedia with a duration of 3 lessons x 45 minutes or 135 minutes every week. The steps of the learning process are preliminary activities for 10 minutes, core activities for 115 minutes, and closing activities for 10 minutes. Preliminary activities are preparatory activities before learning starts such as class attendance. The core activities are the learning process that is carried out such as pre-tests, learning activities using interactive multimedia and post-test questions. The closing activity is reflection, prayer activities and closing greetings.

Results and Discussion

Results

Assessing student learning outcomes is carried out with pre-tests and post-tests for classes X-5 on the material on the impact of geosphere phenomena on life at SMA Negeri 2 Kisaran. The results of the post-test score can be seen in the table below..

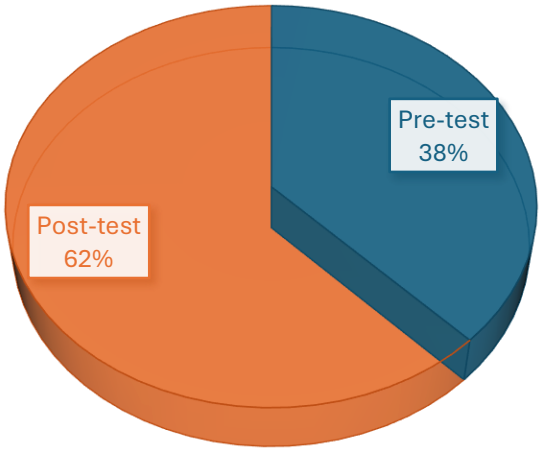

Figure 1. Percentage of Pre-test and Post-test

The pre-tets and post-test scores obtained were significantly different, with a pre-test score with an average of 50.69 and post-tets with an average of 83.75. This shows that there is

an increase in learning outcomes before and after using interactive multimedia media in the learning process. It was concluded that the average score of completing the pre-test was 38% and the average score of completing the post-test was 62%.

Table 2. Students' Post-test and Pre-test scores

No Student	Pretest	Postes	No Student	Pretest	Postes
1	60	90	20	45	80
2	50	85	21	65	90
3	45	95	22	45	90
4	30	70	23	45	80
5	45	90	24	55	85
6	60	85	25	55	80
7	50	80	26	65	95
8	60	85	27	25	85
9	65	75	28	45	90
10	60	85	29	35	85
11	60	80	30	60	80
12	65	75	31	55	75
13	40	75	32	60	85
14	55	90	33	40	80
15	40	85	34	40	80
16	35	95	35	65	75
17	40	85	36	70	90
18	50	80	amount	1825	3015
19	45	85	average	50,69	83,75

Student learning outcomes before being given media action with an average score of 50.69 and none of the students completed their learning outcomes. The provision of action is the media with an average score of 83.75 and all students complete their learning results.

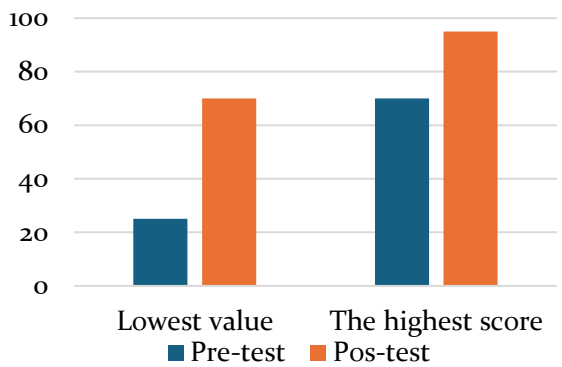

Figure 2. Comparison of Pre-test and Post-test Scores of Students

The pre-test score obtained with the lowest score was 25 and the highest score was 70. The post-test score obtained with the lowest score was 70 and the highest score was 95. There

is a significant comparison obtained from pre-test and post-test scores. It shows that there is an influence of interactive multimedia media on student learning outcomes.

The analysis carried out before testing the hypothesis is a normality test and a linearity test of the data obtained. The normality test in the study used the Shapiro-Wilk test, because the number of samples was < 50, which was 36 students. The data was normally distributed if the significance value was > 0.05 and the data was not normally distributed if the significance value was < 0.05. Based on table 3, the results of the normality test obtained a significance value of > 0.05 in the pre-test which was 0.120 and the post-test was 0.054. So that it can be concluded that the data values are normally distributed. The results of the normality test can be seen in the table below.

Table 3. Normality Test Results

Interactive Multimedia			
Class	**Statistic**	**df**	**Sig.**
Pre-Tes	.952	.36	.120
Post Test	.941	.36	.054

The first test is linearity in the study using the one way anova test, by testing the linearity of variable X and variable Y. The results of the linearity data test can be seen from sig. in deviation from linearity, where the value of sig. 0.297 > 0.05. then it can be concluded that between variable X and variable Y there is a linear relationship. The results of the linearity test can be seen in the table below.

Table 4. Linearity Test Results

ANOVA table							
			Sum of Squares	df	Mean square	F	Sig.
Interactive Multimedia Learning Outcomes	Between Groups	(Combined	766.528	6	127.755	6.152	.000
		Linearity	633.007	1	633.007	30.482	.000
		Deviation from Linearity	133.521	5	26.704	20.766	.297
	Within Groups		602.222	29	20.766		
	Total		1368.750	35			

The last statistical analysis to see the influence obtained is a hypothesis test. The hypothesis test was carried out using spss, a hypothesis with a value of sig. < 0.05 then there is an effect, on the other hand, if the sig. value is > 0.05 then there is no effect. The hypothesis test was carried out by testing 2 variables, namely the interactive multimedia X variable against the learning outcome Y variable. Hypotheses are used to determine acceptance and rejection in a study. The hypothesis test was obtained using the IBM SPSS program version 25. Hypothesis testing was carried out using a simple linear regression test.

The significance value of the results of the simple linear regression test based on the table below, the significance level value or Sig. 0.000 < 0.05 was obtained. This shows that Ha

was accepted and Ho was rejected, which means that there is a significant influence of interactive multimedia media on the learning outcomes of students in class X5 of SMA Negeri 2 Kisaran.

Table 5. Hypothesis Test Results

Anova[a]						
Model		Sum of Squares	df	Mean square	F	Sig.
1	Regression	633.007	1	633.007	29.252	.000[b]
	Residual	735.743	34	21.640		
	Total	1368.750	35			

The next test is the determination coefficient test. The determination coefficient test was to see how much influence independent variables had on the dependent variables seen from R Square in the summary model (Aryani, 2020).

Table 6. Determination Coefficient Test Results

Model Summary				
Model	R	R Square	Adjusted R the Estimate	Std. Error of
1	.680	.462	.447	4.652

The determination coefficient test can be seen in table 6. The result of the determination coefficient test obtained in this study was 0.462, so it was concluded that the influence of independent variables on dependent variables was 46%.

Discussion

Based on the results of the study, the application of interactive multimedia has an effect on student learning outcomes on the impact of geosphere phenomena on life. This study uses a one-group design or one class with tests before learning starts and after learning begins. Class X5 with a total of 36 students was tested before learning started and then given an interactive multimedia treatment after which it was given a test after learning was completed.

The results of the hypothesis test were obtained with a Sig. value of 0.000 < 0.05 and a determination coefficient test of 0.462 or 46%, so it was concluded that there was an influence of interactive multimedia on the learning outcomes of students in class X5 of SMA Negeri 2 Range of 46% and influenced by other variables by 54%.

Interactive learning media is effective cognitively and pedagogically because it is able to present information visually and auditory at the same time, making it easier for the brain to process and remember the material. Cognitively, these media stimulate attention, improve understanding of abstract concepts, and support meaningful learning through engaging simulations and animations. From the pedagogical side, interactive media encourages active student engagement, provides direct feedback, and allows students to learn according to their pace and learning style. This combination makes interactive media a tool that can improve learning outcomes more effectively and fun.

The results of this study are in line with the research of Sugiani (2023), the results of the study show that the hypothesis test uses the anova test with a significance number of 0.000, it is concluded that the sig value of <0.05 is declared influential and Ha is accepted. The results of

this study are consistent with Astriyani's (2022) research which obtained a maximum pre-test average score of 84 and a minimum score of 65. Meanwhile, the average score of the post-test score is a maximum of 92 and a minimum of 73. This shows an increase in the average score obtained before and after using interactive multimedia media. Similar research was also conducted by Nasution & Rohani (2022) and Sari, et al. (2023), with a one-group research design. The learning outcomes obtained through the research are well judged through the use of interactive multimedia media through Canva. The results of statistical analysis in both studies showed a significance value of <0.05, with the conclusion that Ho was rejected and Ha was accepted.

Based on this description, the interactive multimedia media applied has an influence in improving student learning outcomes and is effectively applied to the material on the impact of geosphere phenomena on life. Learning that uses interactive multimedia is considered more engaging because it involves learning videos, quizzes and online discussions in the classroom. This media is also easy to use and apply by teachers and students in geography subjects. The one-group pretest-posttest design has limitations because it only involves one group without a comparison group, making it difficult to accurately isolate the effects of treatment. In this design, changes in learning outcomes that occur after treatment can be influenced by various external factors, such as learning activities outside the classroom, parental support and the environment.

Conclusion

The conclusion in the research is that the application of interactive multimedia affects student learning outcomes on the impact of geosphere phenomena on life. The results of the analysis showed that the use of interactive multimedia media increased learning outcomes as seen from pre-test and post-test increased. This is seen from the difference in the average score of post-test and pre-test, the pre-test score is higher than the post-test score. The results of the hypothesis test using simple linear regression showed that the value of Sig. 0.000 < 0.05, so that Ha was accepted and Ho was rejected. Thus, it can be concluded that there is a significant influence of the application of interactive multimedia on the learning outcomes of class X5 students on the material on the impact of geosphere phenomena on life. The average score of post-test learning outcomes was 50.69, while the average pre-test score was 83.75. The comparison of the lowest and highest scores obtained from the post-test and pre-test is different, the lowest pre-test score is 25 and the highest score is 70. The post-test score obtained with the lowest score was 70 and the highest score was 95. There is a significant comparison obtained from pre-test and post-test scores. It shows that there is an influence of interactive multimedia media on student learning outcomes.

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Authors' Note

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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