



IMPACT OF ARCGIS STORY MAPS ON GEOGRAPHY LEARNING AND REMOTE SENSING SKILLS IN MAN 1 MALANG STUDENTS

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Abstract

ArcGIS Story Map, an online application by ESRI, utilizes the ArcGIS Online platform for map storytelling. This research investigates the effect of using ArcGIS Story Maps as a learning medium for remote sensing in geography on the learning outcomes of students at MAN 1 Malang City. The study is motivated by the low geographic thinking skills and limited student participation in geography classes, particularly in remote sensing topics. The objective is to assess the improvement in geographic thinking skills through this medium. A quantitative approach with a quasi-experimental design was employed. The study population comprised all social studies students at MAN 1, totaling 210 students. Random sampling selected class XI A as the experimental group and class XI B as the control group. Results indicated a significant positive effect of ArcGIS Story Maps on geographic thinking skills. The experimental group achieved an average score of 91.72, compared to 81.09 in the control group. Hypothesis testing using t-test analysis revealed a significant value of $0.000 < 0.05$, confirming a notable enhancement in geographic thinking skills due to the use of ArcGIS Story Maps.

Keywords: ArcGIS Story Map Utilization, Remote Sensing, Geography Thinking Skill

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INTRODUCTION

مقدمة

School is one of the strategic places in the process of changing the behavior of students as human resources who will appreciate nature in accordance with its naturalness (Mohammadi, Keshavarz, & Darabi, 2021). The learning process is a communication process between teachers and students through verbal language as the main medium for delivering subject matter in this interaction the teacher functions as a sender of information, using structured and clear words to convey concepts, ideas and knowledge. meanwhile students act as active receivers, listening, understanding and responding to what is conveyed by the teacher. Communication in this process is very important to ensure that the intended message can be received and understood properly by students so that learning objectives can be achieved optimally (Milyane et al., 2022). In accordance with the times, when science and technology are developing very rapidly, the learning process is no longer monopolized by the presence of teachers in the classroom. Students can learn anytime and anywhere, and what materials suit their interests and learning styles.

Teachers as learning planners are required to be able to design learning by utilizing various types of media and appropriate learning resources so that the learning process takes place effectively and efficiently (Cahyadi A, 2019). To understand the role of media in the learning

process in order to gain student learning experiences, Edgar Dale describes in a cone called the Cone of Experience. This Cone of Experience is used to determine what tools or media are appropriate for students to gain learning experiences easily. Edgar Dale's cone of experience illustrates that the experience of Learning obtained by students can be through the process of doing or experiencing what is learned, the process of observing and listening through certain media and the process of listening through language (Zuhroh, Zuhdi, Maimunah, & Sari, 2023).

Geography learning should involve a more interactive and applicative approach to attract students. Teachers can utilize various media and learning resources such as interactive maps, climate simulations, and exploration of the local environment to make geography concepts more real and more relevant. By utilizing technology and varied learning methods teachers can create a more dynamic and immersive learning experience, helping students understand the material to the fullest and reducing rote methods. For this reason, classroom teaching should be interesting, stimulating, demanding and motivating enough to encourage students to contribute actively and creatively. As expressed by Zainab et al, the teacher is creative and has sufficient knowledge on how to present the material (Abulhul, 2021).

Remote sensing is a technique used to collect data about the Earth's surface without direct contact with the observed object. This technique utilizes sensors placed on satellites or aircraft to capture the reflection and emission of electromagnetic energy from the Earth's surface. The resulting data can include visible light, infrared, microwaves that are analyzed for various applications. including mapping, environmental monitoring, agriculture, forestry and natural resource management (Little, 1974). In mapping, remote sensing data enables the creation of high-precision topographic, land-use, land-cover change and environmental monitoring maps, these data are used to observe climate change, water quality and ecosystem health. In agriculture, remote sensing helps in crop management. In forestry, this technology supports deforestation monitoring, forest inventory, and forest fire management. Natural resource management also benefits from the ability to monitor water, mineral and energy reserves more efficiently (Kennie, 1985).

Students' geography thinking skills involve understanding and analyzing space and place, and human interactions with their environment (Ridha, Utaya, Bachri, & Handoyo, 2019). This includes the skills to interpret maps, understand scale and proportion, and identify patterns of geographic distribution and natural phenomena. Students are also encouraged to develop critical thinking skills by evaluating the cause-and-effect relationships between human activities and their impact on the environment. Thus, these abilities not only help students understand the physical world around them, but also prepare them to face global challenges such as climate change, urbanization, and environmental sustainability (Hamid et al., 2021).

The use of technology and digital tools in geography education has been shown to improve students' understanding and analytical skills of geographic phenomena. One of them is ArcGIS Story Maps, which unites interactive maps with multimedia narratives to create a more in-depth and contextual learning experience. ArcGIS Story Maps as learning media can be used as a tool for delivering material in learning activities through text, photos, videos, audio and also interactive maps. The various features contained in ArcGIS Story Maps can be interesting media because they are complex and contextual and display interactive maps so that the hope is to make contextual learning (Contextual Teaching Learning / CTL) and student-centered learning (SCL) in accordance with the characteristics of geography learning and curriculum demands. ArcGIS Story Maps learning media in this case acts as an external factor that can positively affect students' interest in learning geography (Cyvin, Midtaune, & Rød, 2022).

The research conducted by Restu Ade Yanti et al. titled “The Use of Media Story Maps in Geography Learning and its Implications for Student Learning Interest at SMA Negeri 1 Singaraja” showed notable results. Firstly, teachers were able to implement ArcGIS Story Maps media in geography learning with very good criteria (89.93). Secondly, there was a significant difference in student learning interest before and after the implementation of ArcGIS Story Maps in Geography learning for class XI IIS at SMA Negeri 1 Singaraja ($0.048 < 0.05$). Lastly, there was a positive and significant effect of ArcGIS Story Maps learning media on the learning interest of Geography students in class XI IIS at SMA Negeri 1 Singaraja ($4.234 > 2.048$) (Yanti, Ida Bagus Made Astawa, & I Made Sarmita, 2023).

Similarly, the service results by Muhamad Adam Suni et al. indicated the effectiveness of indirect socialization through Story Maps. This activity utilized Story Maps to present information and counseling media regarding COVID-19, covering general descriptions, case conditions, distribution levels, handling methods, and related regulations. The results demonstrated that interactive maps using Story Maps can effectively present information and counseling during a pandemic. They can also assist related agencies in conducting indirect socialization and accelerating the dissemination of information to the public (Suni & Suni, 2023).

The results of Purwanto et al.'s research, entitled “ArcGIS Story Maps in Improving Teachers' Geography Awareness,” aimed to examine the use of story maps in enhancing sustainable Geography awareness among Geography teachers. The emergence of story maps has transformed current Geography education in the digital era. ArcGIS Story Map, a type of geospatial technology, is easy to use and is believed to help students learn Geography more independently, thereby transforming Geography education. This belief must be reinforced by applying the story map itself (Purwanto, Astuti, Hartono, & Oraby, 2022).

In line with these findings, Waode Yunia Silviana's research, titled “Improving Critical Thinking Skills of Geography Students with Spatial-Problem Based Learning (SPBL),” presents data on the impact of the SPBL model on the critical thinking skills of Geography students. The learning procedures involved students orienting to spatial problems, formulating these problems, collecting and compiling data/information, analyzing, discussing results, and finally building communication. This study involved 78 students from the Department of Geography at the State University of Malang. Ennis' critical thinking indicators were used to create test questions for data collection. An Independent Sample t-Test with SPSS 23 was employed for data analysis. Results showed an increase in students' critical thinking skills after learning with the SPBL model, with 25% of students achieving very critical thinking levels. However, the Gain-Score calculation showed an effectiveness of less than 40%.

Thus, it is recommended that teachers apply relevant learning models to encourage more critical and active participation in the Geography learning process. Additionally, designers should further evaluate the effectiveness of the SPBL model to improve the quality of this educational approach and achieve a more significant impact (Silviariza, Sumarmi, & Handoyo, 2021).

As Donna Aisyah's research entitled: Literature Review: Implementation of the Use of Google Maps Api in Geographic Information Systems “The use of technology is growing very rapidly, one of which is in the field of Geographic Information Systems (GIS) which has developed rapidly since the emergence of Internet technology because it is very useful for sending, sending and receiving easily and quickly. information. Many Indonesians use location applications that can provide distance data and location evaluation because this will definitely be needed by users. Web service applications can be used as a solution to existing problems, and Google provides

various APIs that can be used to create applications that search for places around the user. Google Maps API is an API that can be used to build location applications for users. This literature review will cover geographic information systems applied in various industries, such as health, transportation, tourism, education and others. GIS has also been used on various platforms, ranging from desktops and websites to Android (Model et al., 2016).

The next research conducted by Ahmad Nubli Gadeng¹ et al, entitled “Geography Learning Innovations for Remote Sensing Materials in High School” which shows that the results of the study are remote sensing learning at the SMA / MA level requires an innovation to make it easier for teachers to deliver material, there are two suggested ways, namely first, the traditional way consists of field trips / outdoor studies and image interpretation projects. Second, the modern way, which can use software, and can use drones (Unmanned Aerial Vehicle/UAV). In essence, teachers are required to be creative, technologically literate and able to utilize the environment as a learning resource. The two innovations above facilitate teachers to conduct learning by using interactive media, thus increasing students' interest and improving the quality of learning in remote sensing material in SMA/MA geography subjects. Mokhtar Jaafar (Gadeng et al., 2022). The Effectiveness of Geographic Information System (GIS) on Spatial Thinking Skills (STS) Among Geography Students Ganesan ; Technological advances in education are a process of transition from traditional Learning and Facilitation (L&F) to the 21st-century ones. Geographic Information System (GIS) experts assert that by using GIS, it improves Spatial Thinking Skills (STS) among Geography students (Mayalagu, Jaafar, Choy, & Izwan, 2020).

The weakness of students in mastering Spatial Thinking Skills (STS) is one of the problems in Geography L&F. The experimental research design using the Experimental Group (EG) and the Control Group (CG) was adopted to examine the effectiveness of using GIS that is based on GIS modules to develop Geography students with spatial thinking skills. The discovery of one-way ANCOVA analysis at a significant level of .05 has proven that there is a compelling difference in post-test scores for STS variables [$F(1,57) = 60.511$; $p = .000$, $\eta^2 = .680$]. Also, there was a notable difference between the post-test group EG and CG. Additionally, mean value is high, is EG ($M = 74.83$, $SD = 7.927$) in comparison to CG ($M = 44.27$, $SD = 14.017$). In short, the findings of the study prove that the implementation of GIS activity that is based on the GIS-STs module can notably strengthen the spatial thinking skills among the Geography students. The application of this module in L&F is beneficial and should be extended to Geography L&F in secondary schools (Lee, 2023).

Some of the above studies have in common with researchers, namely examining the role of geography learning media and the benefits of ArcGIS Story, the difference with researchers is that researchers specifically about the Effect of ArcGIS Story Map Utilization as Geography Learning Media Remote Sensing Material on Geography Thinking Ability. Efforts that can be made to improve Geography thinking are by applying games and stories mapped by ArcGIS Story Map in the learning process. So that learning becomes fun and challenges students to master the subject matter, especially remote sensing material.

Based on the description above, the researcher entitled “The Effect of ArcGIS Story Map Utilization as a Geography Learning Media Remote Sensing Material on Geography Thinking Ability of Students MAN 1 Malang City. Which aims to “Is there a significant effect of ArcGIS Story Map Utilization as a Geography Learning Media Remote Sensing Material on Geography Thinking Ability of Students MAN 1 Malang City”?

Participant (Subject) Characteristics

Population and Sample; The population in this study were all students who took Geography subjects in the social studies department at MAN I Malang City, however, because class XII social studies students were taking the National Exam, the researchers took samples from class XI social studies who took Geography subjects at MAN I Malang City. The sample is the entire population. Description of the study Populationas in table 1:

Table 1. Description of research population.

No	Class	Sum
1	X IPS I	35
2	X IPS II	35
3	XI IPS I	35
4	XI IPS II	35
5	XII IPS 1	35
6	XI I IPS II	35
Total		210

The type of research applied in this study is quantitative. is a type of research that presents the results of measurement, calculation, application of formulas and certainty of numerical data in designing, processing, running hypotheses, applying techniques, analyzing data and drawing conclusions. sample determination in this study using Purposive Sampling technique. Purposive sampling technique can be applied when researchers have specific reasons related to sample selection. After discussing with the XI class teacher, it was suggested by the teacher to conduct research in classes XI A and XI.B The reason is because in both classes, Geography subjects are taught by the same teacher and the students are quite stable in contrast to Class X which is still in transition while class XII focuses on graduation preparation exams.

Research Design

The type of research applied in this study is quantitative. the approach applied in this study is a quasi-experiment analyzed by statistical methods. The quasi-experimental approach is used to evaluate the acquisition of information which is an estimate that can be generated by actual data. The research design used was pretest-posttest control group design, where the experimental class and control class were subjected to pretest and posttest. Details of the research design can be seen in the following table 2 (Waruwu, 2023):

Table 2. Research Design

Student group	Pre-test	Treatment	Post Test
Experiment	O1	X	O2
Control	O1	-	O2

Description:

X : ArcGIS Story Map Utilization Treatment as Geography Learning Media Remote Sensing Material

O₁ : Pretest of experimental class

O₁ : Pretest of control class

O₂ : Posttest of experimental class

O₂ : Posttest of control class

In this study, there are two types of variables used, namely independent variables and dependent variables. An explanation of the two types of variables is as follows:

- 1) Independent variable (X): ArcGIS Story Map
- 2) Dependent variable (Y): Geography student learning outcomes

Data analysis

While the approach applied in this research is quasi-experiment which is analyzed by statistical methods. The quasi-experimental approach is used to evaluate the acquisition of information which is an estimate that can be generated by actual data. The research design used was pretest-posttest control group design, where the experimental class and control class were subjected to pretest and posttest. Data collection techniques and instruments used are written tests. Research instruments in the form of tests to measure learning outcomes. Question instruments before being used to capture data and to obtain objective data, first test the validity and reliability. After the data is collected, it is then analyzed which is used for further testing, namely hypothesis testing. Data analysis used the t test with SPSS 25.

The data that has been obtained can be classified into two categories, namely primary data The primary data collection process can be carried out directly in the field using a questionnaire or questionnaire, which is then collected, processed, and presented by the researcher. and secondary data in the form of libraries, previous research reports, books, notes, and so on, In supporting the data collection process and achieving the desired information, an instrument is used in the form of a questionnaire sheet related to the achievement of students' Geographic Thinking Ability learning outcomes. The data collection process is carried out through filling out a questionnaire, where the test sheet for learning outcomes of geographical thinking skills contains several items that must be answered by students according to the actual situation. This step allows researchers to gain comprehensive insight into the understanding and development of student learning outcomes related to the subject matter being studied.

RESULT | نتائج

The following are the results of the analysis of the calculation of the level of difficulty of the items for the pre-test and post-test questions: To carry out calculations, researchers used the Analyze - Correlate - Variate method with the help of the SPSS (Statistical Product and Service Solution) 26.0 for windows program.

Table 3. Level of difficulty of the pretest and posttest class trial items XI B

No.	Question number	Criteria	Amount
1.	8,13	Very difficult	2
2.	18	difficult	1
3.	1,2,3,4,5,6,7,9,12,14,15,17,20	currently	13
4.	10,11,16	easy	3
5.	19	Very easy	1

From the table above the level of difficulty in the pre-test and post-test items in the trial class, it can be seen that the instrument of the test results is different. After being tested3 to XI B class students as many as 35 students have different criteria. Of the 20 items, there were 2 items included in the very difficult criteria with a percentage of 10%, 1 item included in the difficult criteria with a percentage of 5%, 13 items included in the moderate criteria with a percentage of 65%, 3 items included in the easy criteria with a percentage of 15%, and 1 item included in the very easy criteria with a percentage of 5%.

Distinguishing Power

The following are the results of the calculation of the differential power of the test items can be seen through the table:

Tabel 4. Percentage of different power of pre test and post -test items in class trials XI B

No.	Question number	criteria	amount
1.	-	Very well	-
2.	2,3,4,5,7,8,9,10,11,12,13,15,17,18,20	Good	15
3.	1,6,14,16,19	enough	5
4.	-	bad	-

Based on the calculation table of differential power above, it can be seen that the test question instrument after being tested on XI B class students as many as 35 students has the following criteria: 15 items are included in the good criteria and 5 items are included in the sufficient category. Validity test is conducted to test the validity of each item. If there are invalid items, it is better to discard them, while valid items in the trial are used as evaluations in experimental and control classes on Remote Sensing material. In this study, researchers used the SPSS (Statistical Product and Service Solution) 26.0 for windows program. Based on the trials that have been carried out with the number of test students N = 35 and a significant level of 0.458.

Descriptive Statistical Analysis of pre-test and post-test learning outcomes of ArcGIS Story Map Experiment Group

The following are the results of the calculation of the The following are the results of the calculation of the Descriptive Statistical Analysis of pre-test and post-test learning outcomes of ArcGIS story map experiment group can be seen through the table:

Table 5. Results of Descriptive Statistical Test Pretest-Posttest Descriptive Statistics Experimental Group

N	Minimum	Maximum	Mean	Std. Deviation	
PreEkperimen	35	50	95	71,25	22,247
PostEksperimen	35	65	100	91,72	24,789
Valid N (listwise)	35				

Based on the results of the descriptive statistical test above, it can be concluded that the average pretest and posttest scores in the experimental group are different. The pretest value shows an average of 71.25 while the posttest value shows an average of 91.72. Therefore, through this test it can be seen that the average value in the experimental class is quite different with a difference of 20.47. The results of the analysis also prove that there is a difference in the average value before (pretest) is given treatment and after (posttest) is given treatment. This can also be seen from the minimum and maximum values in the experimental class which are quite different. In other words, the experimental class has a higher learning outcome value when compared to the control class.

Descriptive Statistical Analysis of Pretest-Posttest Learning Outcomes of Control Group

The following are the results of the calculation of the The following are the results of the calculation of the descriptive statistical analysis of pretest-posttest learning outcomes of control group can be seen through the table:

Tabel 6. Descriptive Statistical Test Results of Experimental Group Pretest-Posttest

N	Minimum	Maximum	Mean	Std. Deviation	
PreEkperimen	35	55	85	67,19	19,413
PostEksperimen	35	50	95	81,09	22,296
Valid N (listwise)	35				

Based on the results of the descriptive statistical analysis above, it can be seen that the control group has an average pretest and posttest score that is not much different. The pretest value shows an average of 67.19, while the posttest value shows an average of 81.09. Therefore, through the results of descriptive statistical analysis it can be concluded that the control class experienced an increase of 13.09. This means that there is a difference in the average value between before treatment and after treatment. In addition, it can be seen in the minimum and maximum values which support that by giving a treatment can improve student learning outcomes.

T-test

The Paired Sample T-test test aims to determine the average difference between two paired samples. The basis for decision making in the paired sample t-test test is as follows: If the Sig value (2-tailed) <0.05 then H0 is rejected and Ha is accepted..If the Sig value (2-tailed) > 0.05 then H0 is accepted and Ha is rejected. The following are the results of the paired sample t-test calculation below:

Tabel 7. Uji Paired Sample T-Test

		Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2- tailed)
Pair 1	Pre-Post Eksperimen	-19.844	18.600	3.288	-6.035	31	.000
Pair 2	Pre-Post Kontrol	-13.694	13.984	2.472	-5.499	31	.000

Based on the paired sample t-test table above, it can be explained that the results of Pair 1 obtained a significance value of 0.000 <0.05, it can be concluded that Ho is rejected and Ha is accepted, which means that there is a difference in the average student learning outcomes for the experimental class pretest and posttest of the experimental class of the Temporary model, based on the results of Pair 2 obtained a significance value of 0.000 <0.05, it can be concluded that there is a difference in the average student learning outcomes for the control class pretest with the conventional model control class posttest.

Tabel 8. Uji Independent Sample T-Test

		Levene's Test for Equalityt-test for Equality of Mean								
		F	Sig.	t	df	Sig. (2- tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower		Upper
Student Learning Outcomes	Equal variances assumed	1.157	.223	3.125	62	.003	10.625	3.400	3.829	17.421
	Equal variances not assumed			3.125	60.000	.003	10.625	3.400	3.824	17.426

Based on the independent sample t-test table above, it can be seen that the Sig (2-tailed) value is 0.003 <0.005, so it can be concluded that there is a significant difference between the use of ArcGIS Story Map and conventional.

In this study conducted at MAN 1 IPS Malang City Social Studies Department. precisely in class XI A as an experimental class and XI B as a control class. In learning activities there are differences in the use of learning methods. learning methods in the control class use conventional learning methods, namely the lecture method. While in the experimental class using the ArcGIS Story Map method. This learning model has the advantage that students are more active and responsible for the tasks they get. In addition, students become more enthusiastic because they can develop critical thinking skills when they work together in groups.

data obtained which is the pre-test score and post-test score in the experimental class & control class.

Based on this research, it can be seen the results of the descriptive analysis test where the average value in the experimental class increased by 72.2. While the average value in the control class increased by 56.4. This shows that the ArcGIS Story Map learning method is more influential in improving student learning outcomes. Furthermore, for the homogeneity test results, it is known that the significant value of the two groups shows a value of $0.103 > 0.05$. Based on the paired sample T-test that has been carried out, it shows that the Sig. (2-tailed) in pair 1 of the experimental class is $0.000 < 0.05$ and the Sig (2-tailed) value in pair 2, obtained sig. (2- tailed) $0.000 < 0.05$. Furthermore, it is supported by the independent sample t-test which shows that the Sig value. $0.003 < 0.05$, which shows that there is a difference in the average learning outcomes of students. Learning that uses the ArcGIS Story Map method is more influential in improving student learning outcomes.

So with ArcGIS Story Map learning that requires all students to understand the material is done in turn. The results of the above analysis indicate that there is an increase in Geography thinking learning outcomes after applying the ArcGIS Story Map learning model. Based on the results of observations, there are changes in students where at the beginning of the learning activities, students do many other activities or do not pay attention to the teacher when explaining, playing alone during learning. This can be seen at the initial meeting the average value of student learning outcomes of the experimental class is 71.25 while the control class is 67.19. At the last meeting the average value of student learning outcomes increased in the experimental class which was 91.72 while in the control class it was 81.09.

DISCUSSION

مناقشة

In this study conducted at MAN 1 IPS Malang City Social Studies Department. precisely in class XI A as an experimental class and XI B as a control class. In learning activities there are differences in the use of learning methods. learning methods in the control class using conventional learning methods, namely the lecture method. While in the experimental class using the ArcGIS Story Map method. This learning model has the advantage that students are more active and responsible for the tasks they get. In addition, students become more enthusiastic because they can develop critical thinking skills when they work together in groups. data obtained which is the pre-test score and post-test score in the experimental class & control class. Based on this research, the results of the descriptive analysis test can be seen where the average value in the experimental class has increased by 72.2.

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As Donna Aisyah's research entitled: Literature Review: Implementation of the Use of Google Maps Api in Geographic Information Systems "The use of technology is growing very rapidly, one of which is in the field of Geographic Information Systems (GIS) which has developed rapidly since the emergence of Internet technology because it is very useful for sending, sending and receiving easily and quickly. information. Many Indonesians use location applications that can provide distance data and location evaluation because this will definitely be needed by users. Web service applications can be used as a solution to existing problems, and Google provides various APIs that can be used to create applications that search for places around the user. Google Maps API is an API that can be used to build location applications for users. This literature review will cover geographic information systems applied in various industries, such as health, transportation, tourism, education and others. GIS has also been used on various platforms, ranging from desktops and websites to Android (Model et al., 2016).

The next research conducted by Ahmad Nubli Gadeng et al, entitled "Geography Learning Innovations for Remote Sensing Materials in High School" which shows that the results of the study are remote sensing learning at the SMA / MA level requires an innovation to make it easier for teachers to deliver material, there are two suggested ways, namely first, the traditional way consists of field trips / outdoor studies and image interpretation projects. Second, the modern way, which can use software, and can use drones (Unmanned Aerial Vehicle/UAV) (Gadeng et al., 2022). In essence, teachers are required to be creative, technologically literate and able to utilize the environment as a learning resource. The two innovations above facilitate teachers to conduct learning by using interactive media, thus increasing students' interest and improving the quality of learning in remote sensing material in SMA/MA geography subjects. Geographic Information System (GIS) experts assert that by using GIS, it improves Spatial Thinking Skills (STS) among Geography students (Mayalagu et al., 2020).

The weakness of students in mastering Spatial Thinking Skills (STS) is one of the problems in Geography L&F. The experimental research design using the Experimental Group (EG) and the Control Group (CG) was adopted to examine the effectiveness of using GIS that is based on GIS modules to develop Geography students with spatial thinking skills. The discovery of one-way ANCOVA analysis at a significant level of .05 has proven that there is a compelling difference in post-test scores for STS variables [$F(1,57) = 60.511$; $p = .000$, $\eta^2 = .680$]. Also, there was a notable difference between the post-test group EG and CG. Additionally, mean value is high, is EG ($M = 74.83$, $SD = 7.927$) in comparison to CG ($M = 44.27$, $SD = 14.017$). In short, the findings of the study prove that the implementation of GIS activity that is based on the GIS-STC module can notably strengthen the spatial thinking skills among the Geography students. The application of this module in L&F is beneficial and should be extended to Geography L&F in secondary schools (Lee, 2023).

Furthermore, research conducted by" Based on the results of the study, it was found that both in the experimental and control classes there were differences in the understanding of students in the pre-test and post-test So, based on the discussion that has been presented, it can be concluded overall that, in this study the ArcGIS Story Map method has an influence on the learning outcomes of social studies class XI students at MAN I Malang City.

CONCLUSION

خاتمة

Based on the results of the study, it can be concluded that the conditions in class XI A

(experimental), namely the class taught using the ArcGIS Story Map learning model, students become more active and responsive compared to class XI B (control) where the condition of control class students is less than students who are active in the learning process. Based on the calculation, the average learning outcomes of students taught using the ArcGIS Story Map learning model is 91.72 while the average value of learning outcomes of control class students is 81.09. In addition, the average learning outcomes of students taught with the ArcGIS Story Map learning model are better than the average learning outcomes of students taught with conventional learning. This means that the ArcGIS Story Map learning model is the right learning model to improve the learning outcomes of Geography thinking remote sensing material in class XI IPS MAN I Malang City.

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